

DOCUMENT RESUME

ED 246 188

CE 039 092

AUTHOR Perlman, Leonard G., Ed.; Austin, Gary F., Ed.
TITLE Technology and Rehabilitation of Disabled Persons in the Information Age. A Report of the Mary E. Switzer Memorial Seminar (8th, Washington, District of Columbia, November 16-18, 1983).
INSTITUTION National Rehabilitation Association, Alexandria, Va.
PUB DATE May 84
NOTE 101p.; The seminar was sponsored by AT&T, Bell & Howell Foundation, International Association of Machinists and Aerospace Workers, National Institute on Handicapped Research, Postgraduate Center for Mental Health, and President's Committee on Employment of the Handicapped.
AVAILABLE FROM Switzer Memorial Fund, National Rehabilitation Association, 633 South Washington Street, Alexandria, VA 22314 (Monograph #8--\$10.00).
PUB TYPE Collected Works - Conference Proceedings (021) -- Viewpoints (120)
EDRS PRICE MF01/PC05 Plus Postage.
DESCRIPTORS Computers; Counseling Objectives; Counselor Role; *Disabilities; Educational Benefits; Educational Needs; Educational Objectives; Educational Opportunities; *Educational Technology; Employment Opportunities; Futures (of Society); Influences; Information Processing; Needs Assessment; Postsecondary Education; *Rehabilitation Counseling; *Technical Education; *Technological Advancement; Trend Analysis; *Vocational Rehabilitation
IDENTIFIERS Impact Studies; *Information Age

ABSTRACT

These proceedings contain the texts of nine papers presented at a seminar dealing with technology and the rehabilitation of disabled persons in the information age. The first part of the volume consists of the following papers authored by Switzer scholars: "A Philosophical and Cultural Approach to High Technology in Rehabilitation," by Gopal C. Pati; "Technology and Rehabilitation: Another Viewpoint," by Carl E. Sherrick; "Employment and Training Opportunities for Disabled Persons in the Computer Age," by Lawrence A. Scadden; "Impact of High Technology on the Rehabilitation Professional: Changing Roles and Skills," by Susanne M. Bruyere; and "The Future of Information Technology and the Role of the Rehabilitation Professional," by Don McLaughlin. Included in the second half of the proceedings are the following specially commissioned papers: "High Tech/High Touch--Making Good on the Promise," by Douglas A. Fenderson; "Rehabilitation in the Information Age," by Alan M. Hofmeister; "Rehabilitation Counseling in the Age of Technology," by Valerie Ellien; and "The Potential of Technology for Rehabilitation," by David Vandergoot. A brief discussion of the format of the seminar and of this monograph is also provided. (MN)

Technology and Rehabilitation of Disabled Persons in the Information Age

A Report of the Eighth Mary E. Switzer Memorial Seminar

May, 1984

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION
CENTER (ERIC)

This document has been reproduced as
received from the person or organization
originating it.
Minor changes have been made to improve
reproduction quality.

- Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

"PERMISSION TO REPRODUCE THIS
MATERIAL HAS BEEN GRANTED BY

Perlman

TO THE EDUCATIONAL RESOURCES
INFORMATION CENTER (ERIC)."

Published by
National Rehabilitation Association
633 South Washington Street
Alexandria, Virginia 22314

Editors: Leonard G. Perlman and Gary F. Austin

A Memorial Tribute

To Mary E. Switzer

1900 - 1971

Few people realize that she had a satisfying and fully successful career in federal government employment that spanned several decades prior to her formal entry into the field of rehabilitation. She was fifty years old when she became director of the Office of Vocational Rehabilitation in 1950, and she brought to the position a superior intellect and ability. Her many talents and experiences in economics, the legislative process, government administration, health, welfare and public education were only a few of the composite assets brought with her. She entered the movement at a crucial point in its evolution. It was a time in which difficult decisions had to be made between maintaining the status quo or moving to a larger and unknown future but with increased opportunity to serve tens of thousands of disabled persons yet in need.

Following a life pattern in support of increased services to people and a more responsive and humanitarian government to changing human needs, she readily committed herself to the less certain but more hopefully expanded future for rehabilitation. The rest is history. The breadth and humanity of Mary Switzer are stamped forever in the passage of Public Law 565 with its research and demonstration features, its concern for rehabilitation education, its mandate to construct necessary rehabilitation facilities, its totally new characteristic of international efforts and cooperation regarding rehabilitation, and perhaps, above all, in its expanded funding base for more personnel and programs for those in need of rehabilitation services. In the years that followed, she went on to even greater legislative and governmental leadership heights in behalf of both disabled and disadvantaged people.

(continued on back inside cover)

The opinions expressed in this monograph do not necessarily reflect the position³ or policies of the above named organizations or the National Rehabilitation Association.

Copyright - 1983, National Rehabilitation Association, 633 South Washington Street, Alexandria, VA 22314

Table of Contents

GENERAL INFORMATION

Preface	2
Sponors of the Monograph	3
Switzer Scholars	4
Introduction.....	6
Format of the Seminar and Monograph	7
Scholarly Observations of the Seminar	8
The President's Message/The Co-Editors	9
Visual Views of the Seminar	10
NRA Officers and Board of Directors	94
Switzer Monograph Order Blank.....	95
Switzer Planning Committee/Switzer Memorial Committee.....	96

THE SWITZER PAPERS

Chapter One: "A Philosophical and Cultural Approach to High Technology in Rehabilitation" <i>By Gopal C. Pati</i>	11
Chapter Two: "Technology and Rehabilitation: Another Viewpoint"	27
<i>By Carl E. Sherrick</i>	
Chapter Three: "Employment and Training Opportunities for Disabled Persons in the Computer Age" <i>By Lawrence A. Scadden</i>	35
Chapter Four: "Impact of High Technology on the Rehabilitation Professional: Changing Roles and Skills" <i>By Susanne M. Bruyere</i>	49
Chapter Five: "The Future of Information Technology and the Role of the Rehabilitation Professional" <i>By Don McLaughlin</i>	65

SPECIAL PAPERS: TECHNOLOGY AND REHABILITATION

1. High Tech/High Touch - Making Good on the Promise..... <i>By Douglas A Fenderson</i>	82
2. Rehabilitation in the Information Age	87
<i>By Alan M. Hofmeister</i>	
3. Rehabilitation Counseling in the Age of Technology	90
<i>By Valerie Ellien</i>	
4. The Potential of Technology for Rehabilitation	92
<i>By David Vandergoot</i>	

Photo Credits: Ray Kennerly and Dick Dietl

Preface

“High Time for High Tech”

John Naisbitt, the high priest of prediction and author of the best selling book **Megatrends**, electrified the audience at the 1983 annual meeting of the President's Committee on Employment of the Handicapped by his analysis of new and future trends that affect all of our lives.

As I looked around the audience I wondered how many other disabled people were saying to themselves that it's "high time for high tech" to move out of the medical and space technologies and into our lives in other more direct ways, ways that can help us earn a living, communicate more effectively, run our lives the way we want to live them.

I am just a bit impatient with all the forecasts of the splendors to come as a result of high tech. I want my share of these wonders right now and Mr. Naisbitt encouraged their impatience. He said that the important direction in a person's life today is entrepreneurial, an activity made possible by the use of technology. He talked of the strength of the self-help movement which has produced a new value on self-reliance. He spoke of multi-options and a break with the tradition of confining jobs.

These are significant messages for disabled people. A multi-option society means that we can be free to earn our livings in a wide variety of ways with an accompanying recognition for our contributions by a society which honors multiplicity and individuality. Perhaps we will no longer have to pretend to be carbon copies of the rest of the society. We can be ourselves with all of our wrinkles and warts and be independent.

Self reliance. You bet that's the key that disabled people have been searching for. We want to rely on ourselves and move freely in a society that recognizes this desire by eliminating artificial barriers.

Entrepreneurial activity. The opportunity to work for our own sakes, at our own pace, to give free rein to our imaginations and our abilities, aided and abetted by high tech wonders.

I'm all ready to go into this new world of high tech and I suspect that thousands of other disabled men and women are ready too. Where do we start? With our rehabilitation counselor? Will our counselor be able to test our abilities and to plan with us the right kinds of training and education that we will need to succeed on our own? Will our counselor be equipped to know what's available in existing high tech which will free us for the pursuits which we want to follow?

This year's Switzer Seminar examined the role of the rehabilitation professional and the implications of technology on this role. It's a crucial relationship for disabled people. For, ultimately, it is the individual who will seize the opportunity that high tech offers in all aspects of life. It is the individual disabled person who will need the information about the opportunities of high tech. Informed decisions are based on solid information and informed encouragement.

Disabled people need the new vistas that technology appears to be offering. Disabled people need information to plan productive, independent lives.

High tech means new responsibilities for the rehabilitation profession. It demands an understanding of its benefits and its limits. It demands the knowledge of a constantly changing and evolving market. The effective rehabilitation counselor will be conversant with electronic cottage industries, with entrepreneurial opportunities, with the demands of high tech training.

Armed with the information and support of the rehabilitation professional, disabled people can make informed decisions about the role of high tech in our lives. It's high time for high tech.

Harold Russell, Chairman

The President's Committee on Employment of the Handicapped, Washington, D.C.

Sponsors of the Monograph

It is with appreciation that we note the following sponsors
of the Eighth Switzer Memorial Seminar:

★ **AT & T**

★ **Bell & Howell Foundation**
(In cooperation with Microfilm Products Division)

★ **International Association of Machinists
and Aerospace Workers**

★ **National Institute on Handicapped Research**

★ **Postgraduate Center for Mental Health,
New York City**

★ **President's Committee on Employment
of the Handicapped**

The opinions expressed in this monograph do not necessarily reflect
the positions or policies of the above named organizations
or the National Rehabilitation Association.

*Copyright -- 1984, National Rehabilitation Association
633 South Washington Street, Alexandria, Virginia 22314*



Susanne Bruyere, Ph.D.
Assistant Director
RRCEP, Dept. of Rehabilitation
Seattle University, Seattle, Wash.

Switzer Scholars



Thomas Countee
Executive Director
Maryland Park and Planning Comm
Silver Springs, Md.



Ted Daniels, M.S.
Executive Ass't to the Administrator
Rehabilitation Services Admin.
Washington, D.C.



Olivia Diaz, M.S., CRC
Private Consultant in Rehabilitation
Pasadena, Calif.



Valerie Ellien, Ph.D.
Assistant Professor
Dept. of Rehabilitation Counseling
New York Univ., New York, N.Y.



Robert Gilmore, Ph.D.
Rehabilitation Services Admin.
OSERS/U.S. Dept. of Education
Crofton, Md.



Dr. Alan Hofmeister
Vice President for Research
School of Graduate Studies
Utah State University, Logan, Ut.



John H. Leslie, Jr., Ph.D.
Vice President
Cerebral Palsy Research Foundation
Wichita, Ks.



Donald Linkowski, Ph.D.
Professor and Director
Rehabilitation Counselor Education
Geo. Washington, Washington, D.C.



Kali Mallik, Ph.D.
Executive Director, Baltimore County
Rehabilitation Alliance
Baltimore, Md.

Switzer Scholars



Willman A. Massie
Human Services
Program Consultant
Annandale, Va.



Don McLaughlin
West Virginia University
R&T Center
Morgantown, W.V.



Gopal Pati, Ph.D.
Division of Business and Economics
Indiana University-Northwest
Gary, Ind.



Jay Rochlin
Human Resources Manager
AT&T
New York, N.Y.



Lawrence A. Scadden, Ph.D.
Arlington, Va.



Carl Sherrick, Ph.D.
Princeton University
Princeton, N.J.



Angela Traiforos, M.A.
IAM & Aerospace Workers
Disabled Workers' Program
Washington, D.C.



Joseph Traub
Director of Rehabilitation
Technology Program, NIHR
Washington, D.C.



David Vandergoot, Ph.D.
Research Coordinator
Human Resources Center
Albertson, N.Y.



Irving K. Zola, Ph.D.
Department of Sociology
Brandeis University
Waltham, Mass.

Introduction

We, the present adult population, represent the last generation of the industrial age. The present school-age population is the first generation of the information age. We are participating in a massive change in the very structure of society. For those of us whose life span will include the transition between these two ages -- the industrial and the information age -- this is indeed a time of wonder, challenge, and confusion. Like the adolescent caught between childhood and adulthood, we are experiencing that strange mixture of excitement and confusion as some of our traditional reference points dissolve and we try to determine which of the new directions has substance and which are shallow, seductive facades.

These words written by Switzer Scholar Alan M. Hofmeister for this monograph, provides a succinct backdrop for the focus of the Eighth Mary E. Switzer Memorial Seminar.

The topic of the three day seminar was on the use of appropriate technologies in the rehabilitation process in working with disabled persons. This emphasis on where we need to be both educationally and psychologically is essential to all interested in rehabilitation since we are now **in the Information Age**. We can not wait any longer to get on board since the new technologies are upon us. There are many opportunities as well as pitfalls in joining this new generation, but the advantages to those we serve are still largely unknown and virtually untapped. In addition, what is now available is still sadly under-utilized or not well understood.

The Switzer Seminar brought together twenty persons designated as "Switzer Scholars" from a variety of backgrounds and disciplines as well as consumers with an interest in the topic. These very busy and accomplished individuals took this rare opportunity to share their concerns and experiences and come to some useful and realistic conclusions that will provide ideas and guidance to all interested in the rehabilitation of persons with disabilities.

The Seminar was held in Washington, D.C., November 16-18, 1983, and was hosted jointly by the following components of The George Washington University: Rehabilitation Counseling Education Program, Regional Rehabilitation Continuing Education Program, School of Education and Human Development, and the Rehabilitation Research and Training Center in the Department of Psychiatry and Behavioral Sciences, School of Medicine and Health Sciences.

The Switzer Seminar is an activity of the National Rehabilitation Association.

The "Switzer Scholars" were welcomed by Dr. Eugene Kelly, Jr., Dean of the School of Education and Human Development at GWU; Professors Donald C. Linkowski and Donald Dew of GWU; Douglas A. Fenderson, Ph.D., Director of the National Institute on Handicapped Research (NIHR) provided the opening remarks and set the tone of the meeting. Thomas J. Fleming, Office of Consumer Affairs in the White House, provided opening remarks on the second day of the program. Dr. Gary F. Austin chaired the Seminar and coordination was by Dr. Leonard G. Perlman.

Format of the Seminar and Monograph

Five **Action Papers** were written specifically for this Seminar and provided a **foundation** for the program. Deliberations centered around the following papers:

- ★ **A Philosophical and Cultural Approach to High Technology in Rehabilitation**, by Gopal C. Pati, Ph.D.
- ★ **Technology and Rehabilitation**, by Carl E. Sherrick, Ph.D.
- ★ **Employment and Training Opportunities for Disabled Persons in the Computer Age**, by Lawrence A. Scadden, Ph.D.
- ★ **Impact of High Technology on the Rehabilitation Professional: A View Towards Changing Roles and Skills**, by Susanne M. Bruyere, Ph.D.
- ★ **The Future of Information Technology and the Role of the Rehabilitation Professional**, by Don McLaughlin, M.S.

The Action Papers, designated as chapters in this text, were sent to all "Switzer Scholars" in advance

of the seminar. Reviews of each paper were completed prior to the seminar and served to prepare the Scholars for the three days of intensive deliberations on the subject under study.

The seminar provided a forum to discuss each of the basic issues of the new technologies in depth. This was accomplished in both plenary sessions and small group work sessions that focused on each "Action Paper." The three day program of intense interaction culminated in a number of recommendations for action in the areas of policy and program development, service delivery, research, training and legislation.

Format of the Monograph

The format of this monograph closely follows that of the seminar itself. Each of the five "Action Papers" are shown as a chapter and include a section on "Reviews and Comments" of each paper made by the participants. At the end of each chapter there is a summary of recommendations for action in easy to use style.

In addition, invited brief papers were developed by some of the Switzer Scholars and are found in a special section of this monograph.

Acknowledgements

The Eighth Mary E. Switzer Memorial Seminar and the monograph of the proceedings were made possible by a great many people and their organizations dedicated to the independence and rehabilitation of persons with disabilities. It should be noted that funds were initially raised by a special committee of the National Rehabilitation Association (NRA) known as the Switzer Memorial Fund Committee which was guided by Mrs. Olive K. Bannister.

Thanks are expressed to all who played some part in the planning and implementation of this memorial tribute to Mary Switzer. Special appreciation is expressed to the following persons: The Switzer Memorial Committee members: Bill Gardner, Betty Hedgeman, Ph.D.; and Joseph H. Owens, Jr.; to Joan T. Barker, Chairperson, Commission on Professional Concerns; to Marvin

Spears, NRA President during 1983; and to David Mills, Executive Director of NRA and members of his staff: Dick Dietl, Judy Harris and Gloria Scott. Their support and assistance was always there when we needed it; to Douglas A. Fenderson, Ph.D., Director the the National Institute on Handicapped Research. Special thanks go to the host of the Eighth Seminar, The George Washington University, School of Education and Human Development; Dean Eugene W. Kelly, Jr., Donald C. Linkowski, Ph.D.; Donald W. Dew, Ed.D., Terry Martin; and Donald Reiss, M.D., of the Department of Psychiatry and Behavioral Sciences; and to Ms. Gerry Perlman for editorial assistance and final preparation of the monograph.

Finally, our deep appreciation goes to the Switzer Scholars, whose ideas and recommendations are presented in this text.

Scholarly Observations of the Seminar

To summarize, the scope of the seminar can best be illustrated by the following quotes from some of the Scholars:

"Rehabilitation personnel must be helped to become computer literate and sophisticated about the uses of and possibilities of computers before they can persuade their clients to try it."

--Olivia Diaz

"Applications in rehabilitation of the new technologies must relate to the whole array of disabilities, not just those with physical disabilities. These may be the most obvious, but people with learning problems, emotional disorders and social disabilities can also be aided and must be given opportunities."

--Donald C. Linkowski

"I would like to reinforce the position that technology will create viable alternatives for people with disabilities that will result in new jobs and careers. Already in business and industry there are many examples of technology enabling persons with disabilities to perform jobs never before thought possible."

--Jay Rochlin

"'Human factor engineering' research should look at the motivation or psyche of the individual who will be the potential user of the technological device, to discover what will heighten the likelihood of effective use."

--Susanne Bruyere

"Perhaps the greatest revolution in the management of disability will come about not by technology, but rather by biological breakthroughs and in the prevention area of advances in biological, genetic engineering."

--Angela Traiforos

"I perceive both optimism for the future of the disabled and a warning of an increasing gap in the quality of life between disabled and able-bodied populations. The effect is understandable, and can be offset by more intense efforts of the rehabilitation agencies, but are they really prepared for the additional demand?"

--Carl E. Sherrick

"Computer technology is perhaps the single most important vehicle in providing education and training services to persons with disabilities. Homebound education may well be the wave of the future for academic pursuits given the advent of computer and telecommunications technology. Homes may become the satellite campuses of the future."

--Ted M. Daniels

This is only a small sampling of some of the ideas that emerged from the Seminar. It may be true that not all these notions may be novel. The fact remains that some of the best minds in the rehabilitation field continue to recommend that these approaches be tried or at least considered. The recommendations are certainly possible, but can only be **implemented** if they receive broad support of the relevant constituent groups and from many levels of policy-makers.

It should be noted that while the topic of the Seminar involved High Technology or New Technologies, the Scholars were cautioned not to use a technology base as the focus of the seminar since this is **too narrow**. Our concerns for **working with people** should not be subsumed by the promises of High Technology and its by-products.

As Thomas J. Fleming so aptly put it, "The marketplace is going to demand new directions and new innovations as new technologies become a way of life. The future of rehabilitation (and the people that we serve) will depend on our capacity to blend our talents from rehabilitation with those of the business community. We have much to learn from each other."

The President's Message

Microcomputers, minicomputers, bytes, computer memory and the new technologies are terms you will be reading about as you review the proceedings of the Eighth Mary E. Switzer Memorial Seminar. In keeping with the Switzer Committee's objective of examining an important issue that will improve the lives and independence of persons with disabilities, the current topic is not only timely, but critical to the field of rehabilitation which has reached a crossroads. This juncture, of course, is where we **are today** and where we must **set our sights** if we are to insure the best and most appropriate techniques and services to individuals with disabilities in the coming decades.

With the pace of change quickening throughout our society I would urge that we approach the future of rehabilitation with an attitude of high adventure and eager anticipation. The New Technologies and the Information Age are moving rapidly and are effecting all aspects of our culture. One thing remains clear -- the human element -- the rehabilitation counselor will remain a necessary component in the final analysis. It is one thing to be impressed, but we must not be dazzled by the tools of the future. We must, however, learn how to use these tools to maximize our rehabilitative and service delivery capabilities.

I am convinced that the late Mary Switzer, whose name is memorialized by this text, and who was a visionary in our field, would share my enthusiasm for the future of rehabilitation as we enter the Information Age.

Marvin Spears
President, NRA

The Co-Editors



Leonard G. Perlman
Coordinator/Co-Editor
Switzer Seminar Committee



Gary F. Austin
Chairperson/Co-Editor
Switzer Seminar Committee



OPENING THE SESSION: Douglas A. Fenderson, Ph.D., Director of the National Institute of Handicapped Research, addressed the Switzer Scholars to open the 1983 Seminar at The George Washington University, Washington, D.C. Fenderson also authored one of four special papers for the monograph (page 82).

Seminar Scenes



THE RECEPTION: Kay Arneson, who chaired the Sixth Switzer Seminar on Women and Rehabilitation and was a top assistant to Mary Switzer, talked to the Scholars and friends at the annual Switzer Reception. Current Chairperson Dr. Gary F. Austin is on the left, and Coordinator Dr. Leonard G. Perlman is on the right.



HUDDLE UP: Four key figures in rehabilitation had an enjoyable visit at the reception. They are, clockwise from the left: Dr. Betty Hedgeman, NRA President-Elect; Joe Fenton, NIHR; Dr. Margaret Giannini, former Director of NIHR and Kali Mallik, one of the 1983 Scholars.



NO SMALL TALK: The talk is obviously serious at this moment. Sharing thoughts are, left to right, Scholar Ted Daniels, former Scholar Eunice Fiorito, and Scholar Valerie Ellien.



NRA BRASS: Dave Mills, the Executive Director of NRA (the primary sponsor of the Switzer Seminars) gets his point across to Kay Arneson.



Switzer
Scholar
Pati

Chapter One

A Philosophical and Cultural Approach to High Technology in Rehabilitation

By Gopal C. Pati

Essentially, "rehabilitation is a process of restoring an individual to a useful and constructive place in society through some form of vocational, correctional, or therapeutic retraining, or through relief, financial aid or reconstructive resources." The philosophy, i.e., a quest for truth through logical reasoning, is the concept of human dignity which can only be achieved through the self actualization process, which is almost impossible to realize if human beings are needlessly allowed to decay. Such a quest to restore lives and dignity of people through rehabilitation takes place in a cultural context consisting of complex configurations of knowledge, beliefs, morals, laws, customs, opinions, religions, and values.

Of course, societies vary in the way they perceive human beings and their roles in those cultures. Industrial revolutions brought profound changes in our cultures directly or indirectly. That was a long time ago. Technology was introduced in the work places to produce products efficiently and cheaply to meet human needs and increasing demand for varied goods and services as the population increased.

The United States has been a dynamic society with incentives to build technology which would provide its citizens "a good life." In a democratic society such as this, the culture has emphasized work as a source of ultimate power, a mainspring

of motivation to nurture that good life. Competition, technology, more competition and more technology have created a tremendous power base of knowledge, wealth and a society of cultural pluralism which is full of diversity and strength. Technology has been a way of life here, creating its own culture and subcultures. It has affected all of us, our institutions and our approaches to life itself.

Rehabilitation has been impacted by such technology through stages over a long period of time. We have evolved. We feel the impact of technology not only at work or science and research laboratories or in hospitals, but everywhere. This decade is characterized by perhaps the beginning of an era of computers, electronics and information which will change our workplaces, homes, labor forces, skill requirements, education and the way we live.

Technology has been a good partner of the rehabilitation community, a community which has prevented human decay. High technology will also be a good partner in rehabilitation. Our concept of rehabilitation will change to include those who were thought of as being helpless and nonrehabilitable. New jobs and careers will result through the creation of more viable alternatives for the disabled, as well as for those who rehabilitate them. Yes, there will be frustrations as disabled and nondisabled

ed experience skill obsolescence and counselors and placement personnel are forced to learn -- defrost old values, learn new concepts and refreeze new knowledge learned. There will be resistance to change. Some persons with disabilities will refuse to accept technological assistance, while others will reject innovations on the basis of freedom and rights inherent in a free society.

There will be joys, however, as we see more people leading independent lives. But there will be agonies as well, which must be dealt with. As our society reaches a higher level of consciousness, it will realize that technology, high or low, only serve people. It is a means to an end. The cost associated with dislocations and relearning have to be incurred by us. In our society when people work, they pay taxes. Unemployed and unskilled human beings, with or without disabilities, in an information age are truly handicapped. They must be rehabilitated. Ironically the U.S. is one society where we needlessly pay people to stay home. The miracle of rehabilitation recycles a person to a productive life, but at the same time, such human resources are allowed to decay because the culture still views disability as inability.

As the information society continues to influence more people through improved communications, our concept of disability will gradually change to view individuals with disabilities not just as handicapped people, but people as precious human resources. Thus, as time goes by medical models will be deemphasized and human resource models will be intensified in its application with the help of high technology.

In this paper, an attempt has been made to identify some key elements that play crucial roles in the approach to integrate technology into rehabilitation. Some considerations have been directed to (1) define technology to include innovations and knowledge; (2) describe a few cases of happy marriages between the technology and the disabled person and their interface with rehabilitation professionals and employers; (3) outline a human resource model that links the broader organizational climate and education requirements; (4) identify opportunities associated with robotics; (5) discuss employer responses and public policy implications; (6) mention changing requirements of the roles of counselors and job placement specialists; and (7) develop a series of recommendations that are vital to the spirit of rehabilitation in a free society characterized by high technology.

The reader must realize the orientation of this paper is human resource management based. Employment, workplaces and private-public

policies, which are ingredients of a viable support system, and essential to disability management are discussed.

High Technology: Definitions, Opportunities and Promises

Technology has gone through at least three stages: craft, assembly line, continuous process and automation. There is no one definition of automation, but most experts agree to the following components: (1) use of high speed computers for data processing and control; (2) use of closed-loop feedback techniques to facilitate self-control by machines themselves; (3) mechanization of transfer operation; (4) increased use of multipurpose equipments; and (5) combination of jobs and work units in larger self-contained processes.² The field of industrial automation and computer technology and their increased sophistication and widespread usage in business and industry, government, education, homes, communications, agriculture, medicine, etc., are crucial. As John Naisbitt says, "Computer technology is to the information age what mechanization was to the industrial revolution."³

For many people, automation means the world of automatic factories and business concerns run by computers without workers.⁴ The Office of Technology Assessment describes a fully automated factory of the future that might include the following components:

- (1) A computer added design system;
- (2) Numerically controlled machine tools;
- (3) Robots equipped with features such as locomotion, perception and heuristic problem solving; and
- (4) Computerized information systems.⁵

Many of these technologies are used in various stages in various places. Some are in the process of further refinement and research. The combination of these technologies, computers, and the microprocessors have brought about revolutionary changes in our society in such a magnitude that we call ourselves an information society or a high-tech society. Rehabilitation in a high-tech society poses all sorts of opportunities, challenges and dilemmas. To this author, the phenomenon called high-tech is an inevitable economic force in a society which seeks to improve our material standard of living and improve our quality of life in enriching our intellectual, physical and esthetic horizons. Thus, we see the application of computers not only in business and industry, but also in the acquisition of knowledge. Because the "knowledgeables" in our

society are truly free. Computer usage in academic fields are becoming widespread; history, astronomy, music, chemistry, journalism, information science, linguistics, home economics, research in other social sciences, business and economics, and a myriad of other fields are becoming more accessible to many because of high technology. Human beings can learn these and pursue thousands of other professions and interests because of microcomputers. The possibilities are unlimited and vast, at times, beyond human imagination.

People with disabilities will be more capable to pursue life styles and engage in careers as computers and advanced technological discoveries open new doors for them.

Technology in the context of this paper not only includes the advanced machines and equipments but also new knowledge, application of old knowledge in new situations, innovations, and adaptive organizational systems that are parts of that technology. In this context, the application of high technology in rehabilitation is nothing new. In every decade there has been usage of some form of high technology. What we are experiencing now is another phase of man's search for the unknown to serve mankind.

The Disabled and the Technology

- John is a statistician in a scientific laboratory. He is totally blind and uses sonicguide to move about his workplace. A Mowwat sensor assists him to locate objects.

- George is an independent engineering and human resources consultant and an ex-wage and salary expert at a large bank. He was once turned down for admission by a prestigious business school because, "We do not believe a blind person can do the case study work the program required." Since that rejection in 1967, he has completed his graduate study and enjoyed a reputable career. He uses a talking calculator to hear what his eyes can't see. He uses optacom, "a combination mini-computer and camera that converts printed images into vibrations striking his index fingers."

- Paul is a successful blind computer programmer. He uses optacom, a braille writer, tape recorder and a card reader.

- Barbara is deaf and head of a community service agency. She uses TTY, an invaluable aide in the world of silence, to communicate with the world of noise. The interpreter who assists her from time to time uses TAD (Telephonic Assistance Device) to speak for Barbara to a second party.

- Judy is a stockperson in a mail order house. She uses electrowriter to handle written orders.

- Tom is a polio victim who works for a reputable engineering institute. He uses a battery operated, computerized wheelchair to move around. He uses an ordinary typewriter, telephone and a tape recorder with some steel attachments. He operates them by either a long stick held in his mouth or by remote control-puffing or sucking on the tube that activates the chair.

- Paula, who is paralyzed, can operate her vehicle with pedals and her friend, with both legs and an arm paralyzed, operates her auto by controls built into the steering column.

- Through the Homebound programs, paraplegics, quadraplegics, persons with muscular dystrophy, spinal bifida, multiple sclerosis and cerebral palsy, etc., are learning computer programming and entering meaningful careers. Orthopedically disabled persons and students learn and earn a living just staying at home. Thanks to the semiconductor and microprocessor revolution and those other remote control technologies and those self-study programs or video tapes, audio tapes, programmed instruction and the remote access terminals which have already changed many lives and motivated many more to regain dignity and self-worth.

- The ingenious National Institute for Rehabilitation Engineering is developing devices such as an electronic speaker that unscrambles the speech of a person with cerebral palsy; an automatic feeding machine that stops a rotating plate and lifts a food laden spoon to the user's mouth; a typewriter with recessed keys for the spastic; and special typewriters for typing with the toes.

There are thousands of technological devices and engineering breakthroughs that exist in our society today and numerous more to come have potential to recycle human lives for fuller productivity and self-fulfilling lives. Development in science and technology, researching biomedical engineering, advances in physical and mental therapy will continue to prolong life and occupy a paramount place in the scheme of rehabilitation.

A brief reflection of the cases cited above suggest some interesting things:

- (1) The work world we live in is a living laboratory of human relations in which people of divergent interests and professions work together to help people to help themselves.
- (2) Most of the individuals (previously discussed) work in high-tech environments.
- (3) Science and technology have been used to assist them to achieve their vocational and personal goals.

- (4) Rehabilitation professionals have been involved in referral, evaluation, counseling and guidance, physical restoration, training for occupations, placement in employment, facilitating and expediting to acquire auxiliary services, not to mention the fact that these professionals have caused many happy marriages between men and machines.
- (5) These individuals have been motivated to survive, compete and grow.
- (6) Employers in these cases have been very responsive in utilizing the disabled because of their qualifications not because of their disabilities.
- (7) We are beginning not only to survive today, but also we are learning to prepare for tomorrow, which is almost here today.

High Technology, Educational Needs and A Human Resource Model

In a high technology society there will be growing prevalence and importance of nonfactory jobs, positions in service industry and white collar occupations. The opportunities that are created in this environment are information based. The jobs typically require conceptual and perceptual skills frequently replacing the manual and motor skills

once required of jobs in craft or mass production technological environments. This new environment diffuses extreme divisions of labor and creates generalists who may have specialties in one or two areas, but must understand and appreciate the total picture -- a person who can be flexible and interdependent. In this setting a person instead of performing meaningless repetitive and specific small tasks, performs monitoring of a vast array of expensive equipment or "oversees" the "magic machines" which controls the other machines.

Gradually, the individual in this environment becomes more responsibility oriented not task oriented, resulting in higher organizational commitment. He commits to team work, a pivot around which the concept of integrated technologies revolve. For a high technology to survive, it must accompany the "high touch" (high level of human relations) among workers who work in teams. For organizations to survive, it requires a high degree of top management commitment to human resource management and a congenial organizational climate in which all people, disabled and nondisabled alike, can survive, compete and grow. The following simple model may be considered.

Some clear implications for the people with disabilities emerge:

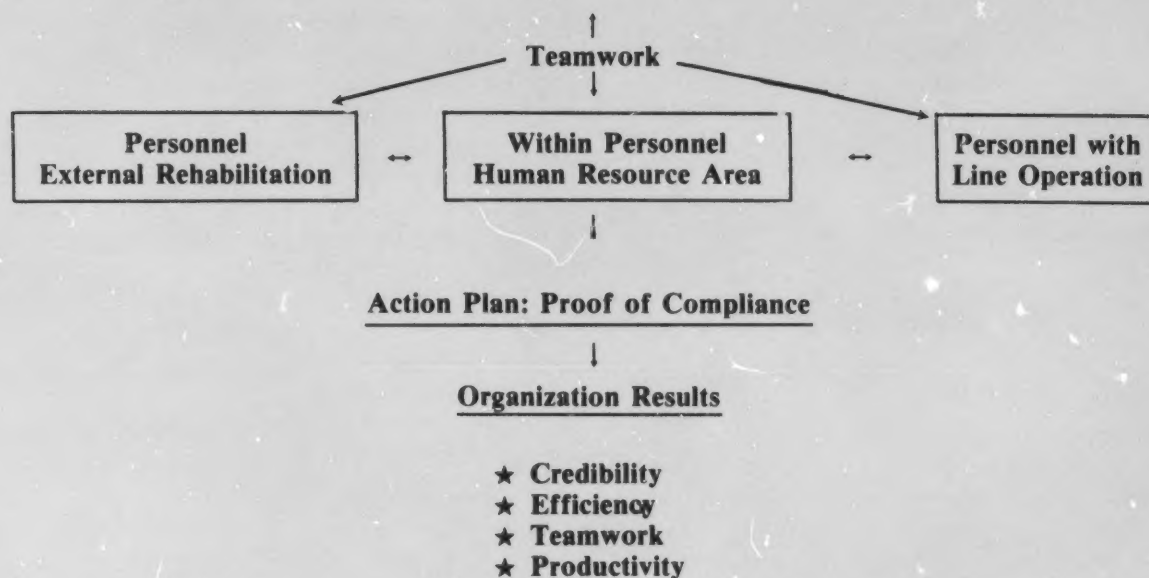
- (1) Many disabled people have found jobs and

**Figure 1. Human Resource Management Model:
Internal Support**

All Employees -- Including the Handicapped

Internal Support: Specific Activities

- ★ **Meaningful and Selective Placement**
 - ★ **Orientation Nitty Gritty**
 - ★ **Supportive Supervision**
 - ★ **Training and development**
 - ★ **Opportunity for Growth and Mobility**
 - ★ **Recognition of Employee Uniqueness**
 - ★ **Fair Performance Appraisal**
 - ★ **Achievement of Personal Goals**
 - ★ **Consistency and Fairness of Rules**
 - ★ **Strong Leadership to Inspire and Give Direction**
 - ★ **Sense of Belongingness**
 - ★ **Freedom to Speak and Participate**
 - ★ **Organizational Receptiveness to Ideas**
 - ★ **Organizational Openness to Clarify Things**
 - ★ **Accommodations**
-



Source: Gopal C. Pati and John I Adkins, Jr., with Glenn Morrison, **Managing and Employing the Handicapped: The Untapped Potential**, Brace-Park Press, Lake Forest, IL, 1981.

found meaningful lives not because technologies have created opportunities, but the disabled have prepared for them and taken advantage of them. As a matter of fact, in many situations, education and skill have made the true difference in their lives, not their disabilities.

- (2) People with disabilities like their nondisabled counterparts must rededicate themselves to learning and mastering basic skills such as reading, writing, and mathematics. Such skills can be transferred to many areas in the new environment.
- 3) Meaningful occupations in high-tech environments typically require higher levels of education in numerous situations. The much touted computer programming and computer related opportunities, for example, have motivated many individuals to take programming to meet the expected shortage in the market place. But many high tech employers are not just looking for any programmer, but those who understand the total system which frequently requires knowledge of business management, economics, marketing, production and ac-

counting. Therefore, those persons who are getting a sixth-month or two year certificate program in computer training probably would not find a job or lose one as quickly as he finds it, if not accompanied by continuing education in functional areas of business.

- (4) Yes, technology creates opportunities, but who prepares individuals for these opportunities? The educational institutions do., And yet because of attitudinal, architectural, logistic, and accessibility barriers thousands of people with disabilities can't pursue education which would assist them to pursue a meaningful life. Challengers to this notion may pursue a study of numerous court cases involving alleged violation of Section 504 of Vocational Rehabilitation Act. Such a study and the findings may cause "stomach pain." What I mean is that the contradiction becomes obvious. There are opportunities, yet a person cannot take advantage of them because our educational institutions deny him the opportunity to do so. So in this instance, the opportunities for the

persons with disabilities in a high-tech environment is simply an illusion.

- (5) That illusion creates another real problem. Persons with disabilities, like their nonhandicapped counterparts, show little "drive" or "ambition." As Allison Davis said in 1946:

"Indeed, only when one knows where his next weeks or next months shelter will come from, can he and his children afford to go in for long-term education and training, the endless search for opportunities, and the tedious apple polishing that the attainment of higher skills and occupational status requires."[†]

Many persons with disabilities hang on to what they have to avoid that illusion. Somehow they meet their minimum needs either through government assistance or support from family and friends. Many hesitate. Others wait for the better days to come. Technology is meaningless to them if the delivery is not there. This problem is real!

The Robotics: The R'D's, C'POs and Beyond

Like many things in life, high technology is not an unmixed blessing. A number of counselors and job development specialists in this nation have raised concerns about the fact that robots in high technology environments or mass production technology will reduce opportunities for the disabled. It is important that we engage in a brief discussion about the nature, role and consequences of robotics in rehabilitation.

"It takes people to operate a technical system, and there is no technical system without a social system." The technical factor depends upon the human factor. The machine cannot think, we may program them to behave. Robots, a form of high technology can be an invaluable tool in rehabilitation. Robot has been defined, "as a reprogrammable, multifunctional manipulator designed to move materials, parts, or specialized devices, through variable programmed motions for the performance of a variety of tasks -- robots may be programmed to perform different tasks."⁸ There are low technology robots called non-servo-controlled robots performing a single program -- doing one task repeatedly like many human beings perform on auto assembly lines. The high-tech robots are called servo-controlled robots and are equipped with internal and external skills. With the introduction of artificial intelligence, they can perform varieties of programs and tasks. In the United States there are approximately 5,000 robots of high and low technology. Most of them are used in paint spraying, loading and unloading machines, routine

inspections, metal fabrication, drilling wings of aircraft, assembly lines, conveyor transfer, and material handling. They can also be used in situations or work environments too dangerous or dirty for any human being. Robots can be helpful in cleaning nuclear reactors or "decommissioning" the same, guarding human beings while involved in underseas activities, or working in hazardous work environments dominated by toxic substances. Thus, robots can prevent the dumping of disabled and nondisabled people in dull, routine and dangerous jobs in contaminated environments and open doors for better things and better opportunities for persons with disabilities. Some of these possibilities are:

- More job opportunities in industries which make robots;
- More job opportunities in research and development organizations;
- Maintenance positions to maintain those robots;
- Robot operators who will operate them;
- Positions of new programmers to develop new software;
- Creation of new programmers to develop new software;
- Availability of low cost robots will assist homebound persons with disabilities to do "chores" thereby improving their quality of life.

Yes, it is true robots and their use will cause the problem of displacement of unskilled labor. But then the problem is not high technology, the real problem is retraining of displaced persons. It is true that technology takes away jobs, but it creates new ones also. If technology creates massive unemployment, then the United States, the technological center of the world, should have the higher unemployment rate than that of other countries in the world! Has it happened? If anything important causes unemployment, it is sluggish economy without high level of productivity. Not to mention our inability to provide retraining, redevelopment and to develop a linkage between the initiators of technology, the users of technology and our educational system. Furthermore, the notion that our country will suddenly turn into a silicon valley is as meaningless as the notion that high technology will provide most of the job opportunities in the future. The truth of the matter is that future job opportunities will come from small businesses and "mom-pop" organizations which will be labor intensive for many years to come. Oh, yes, many small employers will be using personal computers, but the fact still remains that large computers or high-tech based operations will employ fewer peo-

ple, but their vendors and suppliers, the small and medium size organizations, will be employing the most.

Yet, these organizations know very little about the capabilities of persons with disabilities, the whole process of selective placement, the role of technology which makes a persons with disabilities self-supporting. Rehabilitation professionals can use robots (when it is available at a price that an average citizen can afford) to make independent living for persons with disabilities somewhat easier. They can look for positions, for example, for trainable mentally retarded adults who may have lost their jobs (because of robots) and place them in those small and medium sized operations. They can seek out those employers and convince them that disabled people could be partners in improving productivity through their dedication, loyalty and job competence.

We must realize that the final result of rehabilitation is to assist the individual in question to regain dignity through meaningful occupations and independent living to help that person to achieve independence. If that can be done with high technology (and I think in many cases it can be done) then let the robots do what the persons with disabilities should not be doing anyway, simply because they are human beings. Once the initiators and users of technology realize that technology has been invented to serve the people in a free society, then the slogan "equality of opportunity" becomes meaningful because we dedicate ourselves to provide accessible training and retraining and education which will be needed to readjust to the economic, social, and cultural restructuring that are going on in the United States.

Employers and Public Policy

The bottom line of rehabilitation is meaningful placement for an independent life, which may be adversely affected if employers are not ready to utilize the abilities of the disabled. On the basis of my personal experience, I would venture to classify employing organizations into three major categories irrespective of their technological sophistication.

Category I. In these organizations persons with disabilities have been a stable part of the workforce long before the handicapped awareness movement started in the 1970's and the consequent passage of the Vocational Rehabilitation Act of 1973 and the Education of All Handicapped Children Act of 1975.

Category II. These organizations have merely reacted to the laws. The employers in this category

have strengthened their legal staff to fight discrimination charges and engage in delaying tactics to keep the disabled out of their door.

Category III. These organizations are virtually doing nothing. They are waiting for the next move by governmental agencies. They are watching what other organizations are doing. They think the "handicapped" programs are a passing fad.

High technology organizations may fall in any one of these categories. Not too long ago an electronic defense contractor with contracts totaling about \$53 million to manufacture electronic systems and equipment were heavily fined. What did the federal investigation reveal?

- (1) *A Preemployment medical examination that was not job related.*
- (2) *Automatic exclusion of applicants on the basis of their handicap, even though there were plenty of jobs qualified persons with disabilities could do.*
- (3) *Discrimination against employees with invisible handicaps, such as obesity, color blindness, high blood pressure, allergies, and varicose veins.*

The final settlement involved \$225,000 back pay awarded plus interest to 85 persons with disabilities; granting of job preference to 32 of the back pay recipients; promise of reasonable accommodations and a major overhaul of personnel procedures and policies.

A disabled individual may acquire higher education and a marketable skill for a suitable position in a high-tech organization, but if there are unwritten rules and policies based on ignorance and myths, high technology and vocational rehabilitation are useless for him.

There are over 250,000 contractors who do business with the federal government and employ over 31 million people in this country. There are thousands of employers in health care, education, recreation, food services, etc., who also do business with the federal government and employ millions more. Municipalities, state governments and their agencies also employ millions. They are all supposed to be covered by the handicapped statutes cited before.

The problem here is that there are not many employers such as Dow Chemical, E.I. DuPont, Hewlett Packard, IBM, Xerox, Telktronix, Control Data, 3M, Lockheed, Union Carbide, TVA, and a few more who have not only established leadership in utilizing disabled people, but also developed selective placement technologies and established meaningful relationships with rehabilitation communities to put all the technologies to work to benefit the disabled, the stockholders as well as the society. Most of their organizational climates also are more conducive to work and job satisfac-

tion. Organizations such as these have a lot to feel proud about. These organizations and many more simply do not mind to pay for devices, incur the cost of rehabilitation technology, pay for the cost of in-house selective placement staff and hire outside experts necessary, as long as they find disabled people who can perform the jobs and are qualified.

In addition, organizations with a human resource philosophy provide extensive training and retraining for their employees to fight managerial, supervisory and employee obsolescence.

But there are thousands of employers in our nation who are not even covered by the Vocational Rehabilitation Act. Many do not do business with the government. The federal and state and city governments are not exactly the models in employing the disabled. A lack of concern or callousness to employee displacement is appalling. In a large survey conducted by Business Week/Harris Poll, it was found that 64% of the companies offered no formal training opportunities to those displaced by high-tech office automation.⁹

Rehabilitation does not take place in a vacuum. Employers have to be partners with rehabilitation and educational communities to keep our human resources well nurtured and well trained. Failure to do so in a rapidly emerging high-tech society will be a disaster not because of technological progress, but because some "gurus" in social and political systems do not care about people enough and allow them to needlessly decay.

The implications of the above paragraphs are very simple. To be blunt: Our approach to technology, if it is to serve the national interest, must accompany with it sensitivity that encourages outreach, partnerships, funds to train and retrain, and a high commitment to people per se, disabled and nondisabled alike. That means in order to motivate the employers in category II and III, present laws must be vigorously enforced and future laws enacted/or existing laws revised to force these organizations, their vendors and suppliers, to utilize disabled people. After all, during only the last 10 years and primarily because of the legal pressure, we are just beginning to see some awareness and resultant utilization of technologies to aid the disabled.

Some may argue that in a private enterprise system, efforts should be made voluntarily. Yes, Category I employers have done just that. But what about the employers and institutions in Category II and III? Human degeneration in the name of private enterprise cannot be justified! In a democratic society rights and obligations are intert-

wined. If an organization only wants rights and pays no attention to obligation and the result of that failure is loss of human dignity, loss of economic freedom for innocent people, social justice cannot prevail. Therefore, it is not at all surprising, for example, that in Austria, the Disabled Person's Act of 1969, requires private employers to set quotas -- one disabled person for the first 20 employees and at least one additional disabled person for every 25 following employees. In 1976, Japan revised its labor law to require companies employing more than 300 employees to hire persons with disabilities as 1.5% of the total work force and pay a fine of about \$100 monthly for each persons with disabilities not hired.

I have never favored hard quotas in this society. As a matter of fact, I have always viewed Affirmative Action Programs as a good human resource tool. The disabled community also discourages the quota idea. But given the technology that we have and what is yet to come, a more understanding attitude on the part of employers can make a dramatic difference in the lives of thousands of persons with disabilities who would be paying taxes to enrich the federal treasury instead of emptying it! But that attitude is not evolving fast enough. Stringent legislative action is virtually needed and now, before technology plays havoc with our lives.

Rehabilitation Counselors and Placement Specialists

Successful counselor and job development specialists have not only kept pace with advancement in machines and equipments, but also changes in the environment: social, political, economic, scientific and cultural. Researchers in rehabilitation (consisting of specialists from so many fields) have made profound contributions. The problem has been one of the dissemination of information and availability of appropriate opportunities where their ideas and models can work. Where the opportunity and funding have been made available numerous rehabilitation specialists have repeatedly demonstrated what can be done to serve disabled people, the work settings, and society at large.

- *The art of selective placement is a technology.*
- *The computerized human resources system is a technology.*
- *Aides and devices for the blind, deaf, orthopedically disabled, heart patients, individuals with multiple disabilities, etc. are also technologies.*

- *Programmed learning through PLATO or career decision making through SIGI (System of Interactive Guidance and Information) are also technologies.*
- *Job and applicant matching through computer systems is a technology. (Linkage model, EIFPWI, for example).*
- *PWI (Projects With Industry) is a technology.*
- *Computer-based career matching systems is a technology.*
- *Computer-based position analysis, environmental analysis, and task analysis is a technology.*
- *Human resource forecasting for the future is a technology.*
- *Job accommodations, job restructuring, program accessibility, and environmental modifications are also technologies.*
- *The art of cultivating a relationship between rehabilitation specialists (counselors and placement specialists) and employers is a technology.*
- *Proper marketing of a job-ready client is a technology.*
- *An innovative approach to labor-management cooperation is a technology.*
- *A system of flexi-hours and home-based work is also a technology.*

I can go on forever citing examples. My point is that knowledgeable counselor and job development specialists have used these and other innovations as aids to serve disabled people. There is nothing new about that; but what is interesting is that these tools, and many more to come in the future, can be used more fully to assist rehabilitation professionals to do even a better job to help the disabled in the future. Technology and innovations are their new allies. The high-tech phenomenon needs to be understood in its organizational, social and economic context if we are to take full advantage of what we have and what is yet to come. I will present the following thoughts from the standpoint of the world of work (within the framework of partnerships) and the urgent tasks that confront us.

(1) The role of counselor in the job development scheme needs to be thoroughly reconsidered. Currently, many counselors in the nation are "all things to all people." This is not practical with emerging new realities. Job placement itself is a fulltime job. Those two func-

tions need to be separated. Counselors and job developers must work together, but one has to work externally, the other internally. A combination of these two roles only produces "burnt out" human beings serving no one.

(2) The curriculum structures in the schools of rehabilitation must go through some changes. Historically these human service professionals have been subjected to curriculum (and rightly so) that are heavily psychology and sociology based. But today these curricula must include education in labor economics, personnel management, management information systems, accounting, and organizational behavior courses must also be included.

(3) Such curriculum must also be backed up by a system of continuing education linked to economic incentives. Innovative institutions such as the Rehabilitation Institute of Chicago, National Institute for the Deaf, Research to Prevent Blindness, Office of Technology Assessment and other organizations specializing in rehabilitation engineering techniques etc., could be visited on a required basis. I know many seminars are available. But counselors and job placement specialists are handicapped by lack of availability of time, money and energy. What incentive is there anyway?

(4) Many counselors and job developers are also disabled by a lack of delivery of the technology and devices that do exist. One counselor-cum-job developer wrote to me:

"...The basis of my frustration is simply the availability of equipment to the people who are in need the most. Cost in many cases are prohibitive...and many of the governmental agencies that are established by law to train and assist the disabled to obtain the support services for independent living do not have a positive attitude in providing this type of technology...as you might anticipate these agencies have the excuse that these devices are too expensive...I cite, for example, talking wheelchairs used by individuals with C.P., versabraille, as well as reading machines, used by blind individuals...not to mention the bionic lens...High technology makes a great impression on the evening news, but my experience in the field of rehabilitation is that it has had little impact..."

(5) Job development specialists must realize that this country may be high-technology based, but there will be opportunities, as there have been in the past. Yes, it is true that future occupations will be white-collar based, but it is also true that most job opportunities will be available in smaller organizations and service type occupations. Large high-tech organizations have the possibilities of multiple placements, but that's not where the action will be in the future. As indicated before, the real opportunities will be in smaller organizations in which managers know very little about selective

placement. These enterprises with limited resources will be forced to maximize profitability through machine-human productivity. Rehabilitation professionals will be a valuable asset to these employers. Persons with disabilities can be partners to improve productivity.

Furthermore, as the focus of the labor market becomes more localized and regionalized, the system such as C.I.D.S. (Statewide Career Information Delivery Systems), which is computer based, will provide national, state and local career information. Such information can be utilized by counselors as well as job developers to engage in selective targeting instead of wandering in the woods. To take advantage of this opportunity, the counselors, as well as job developers, must learn what information technology can or can't do for them.

Recommendations for Action

1. Individuals in our society must master the skills in the 3rs. Our educational system must provide these basic educational skills to the youngsters and adults in this democratic society.
2. Liberty and justice have little meaning in an information based society, if individuals with or without disabilities do not have marketable skills and education. The curriculum of all educational institutions must include computer literacy.
3. There must be vigorous enforcement of laws governing the removal of architectural barriers. An individual cannot get an education, let alone a marketable education, if persons with disabilities cannot go to the classrooms.
4. The cost of devices and technology as aids to the disabled should be paid by the government. Such an expenditure should be viewed as an investment with anticipation that employed persons with disabilities will pay taxes.
5. Anti-discrimination laws must be vigorously enforced. Since disability transcends race, color, creed, national origin, religion, sex and age, I am in favor of a "quota system" for all employers which employs or attempts to employ qualified persons with disabilities. All employers must be covered. Heavy fines should be imposed on those employers who make no efforts. The funds generated from these fines should be used to make aides and technologies more readily available to the disabled community and in expenditure involving research and development which make independent living possible.
6. Cooperative programs such as PWIs must be encouraged, supported and funded. Such part-

nerships make rehabilitation truly an interdisciplinary phenomenon, making high-technology a source of power and knowledge to serve mankind. Such partnerships will not only enrich the parties, but also develop programs to train and retrain individuals displaced by advanced automation.

7. Schools of rehabilitation must change or modify their curricula to better prepare counselors and placement specialists.

8. Employers must realize that high-tech environment requires employee relations based on better quality of work life. Such efforts coupled with a flexible work climate not only improve productivity, but also places the disabled into the mainstream. All of us benefit.

And finally, the philosophical and cultural approach to high technology in rehabilitation is action-oriented and support-oriented. Major institutions in our society must work together to create a climate in which rehabilitation and high technology can work together to provide our disabled citizens meaningful movements and a decent place in a civilized society.



References

- ¹ Webster's Third New International Dictionary, Springfield, MA, G & C Merriam Co., 1976
- ² James Bright, *Automation and Management*, Boston, Harvard Business School, 1958. Floyd Mann and L. Richard Hoffman, *Automation and The Worker*, New York, Holt, Rinehart & Winston, 1960. Charles R. Walker, *Toward the Automatic Factory*, New Haven, Conn., Yale University Press 1957.
- ³ John Naisbitt, *Megatrends*, New York, Warner Books, Inc., 1982, p. 28.
- ⁴ Leonard Broom and Philip Selznick, "Technology and Human Relations" in Simon Marcson, *Automation, Alienation and Anomie*, New York, Harper & Row, 1970, p. 20.
- ⁵ *Exploratory Workshop on the Social Impacts of Robotics: Summary and Issues - A Background Paper*, Washington, D.C., Office of Technology Assessment, 1982, p.9.
- ⁶ Allison Davis, "The Motivation of Underprivileged Workers", in William F. White, ed., *Industry and Society*, New York, McGraw-Hill, 1946, p.89.
- ⁷ Leonard Broom and Philip Selznick, "Technology and Human Relations" in Simon Marcson, ed., *Automation, Alienation and Anomie*, New York, Harper & Row, 1970.
- ⁸ Gail M. Martin, "Industrial Robots Join the Workforce", *Occupational Outlook Quarterly*, Fall, 1982, . 2.
- ⁹ *Business Week*, April 25, 1983.

Excerpts of Reviews and Comments

The following are excerpts of reviews, comments and questions raised by the Switzer Scholars. These are presented to further stimulate thinking, discussion and action as it relates to the content of CHAPTER 1 by Gopal C. Pati.

The author's analysis of key elements that play a crucial role in the interaction of technology and rehabilitation is indeed thought-provoking. Technological advances such as the computer and its use in the rehabilitation enterprise is well documented by the author as an important factor in rehabilitation outcomes. I am particularly interested in the author's view of High Tech as an economic force. The author stated "...the phenomenon called High-Tech is an inevitable economic force in a society which seeks to improve our material standard of living and improve our quality of life in enriching our intellectual, physical and esthetic horizons." This ideal is a reality for many in our society for those fortunate to take full advantage of the opportunities created by High Tech. For others, the unfortunate ones, such opportunities will not exist without intervention on the part of our policy makers.

The proliferation of computer technology has catapulted society into the Information Age. More and more households will have computers for a variety of uses from Computer Aided Education (CAE) for the children and adults to financial planning for home budgeting and business purposes. Such capabilities will serve to enrich the lives of individuals and families.

The cost of computer equipment, however, will preclude its existence in the households of low income families. Consequently, the "prosperity gap" will continue to widen between those who can afford and those who cannot afford computer equipment.

Most persons with disabilities are not in the labor force and are living on low and often, fixed incomes. Because of their low economic status as a group, persons with disabilities, for the most part, will not enjoy the benefits of home based computer technology. Moreover, non-white persons with disabilities as a subgroup are among the poorest in this country and are therefore much more disadvantaged with regard to reaping the benefits of computer technology.

For an example of the ways the "prosperity gap" widens, consider one's opportunity to engage in a relatively new summer educational activity -- the computer camp. Because of the increasing presence of computers in our everyday lives, it is apparent that "computer literacy" must be taught early in life, hence, computer camps are becoming increasingly popular.

The costs of computer camps, in most cases, are prohibitive to even moderate income families and certainly in low income families. Low income families will therefore be excluded from this opportunity for an enriched and enhanced quality of life. Prosperity will tend to rise on the side of those who can afford these costly educational opportunities and concomitantly widen the gap between those who can and cannot.

Without governmental intervention and leadership most persons and families on the lower rungs of the socio-economic ladder will not be granted the opportunity to participate in these computer training activities whether or not they have disabilities.

Our forefathers had the wisdom and vision to establish a system of public education in order to maintain and increase literacy and thus facilitate the development of a new nation. With the advent of "computer literacy" and the revolution brought on by the proliferation of computer technology, there is a need for our contemporary policy makers to consider the tremendous impact that society will face and employ their wisdom and vision to construct public policy that will address the inequality between certain groups within the population. U.S. public policy can be formulated in various ways to facilitate the distribution of computer knowledge as an opportunity for all persons who wish to avail themselves of it.

The acquisition of computer literacy and knowledge for all persons, especially our youth, is of such importance that our policy makers should consider the implementation of a redistribution program to ensure that low income families are pro-

vided equal opportunity in this area. Families could receive tax credits or vouchers based on their income levels for the cost of their attendance to computer classes and/or camps. Corporations could be provided incentives in the form of tax credits or other mechanisms for acts such as the donation of computer equipment in public schools. These are but a few examples of how public policy can serve to ensure equal opportunity for persons with disabilities.

-- Ted Daniels

In our euphoria over high technology and what it means to rehabilitation of disabled persons, Dr. Pati has pointed out some very practical problems. Not the least of which is resistance to change by counselors, administrators and clients. Resistance to change is often based on ignorance and not being able to control the situation.

This is why educational opportunities; for counselors, administrators and other rehabilitation professionals are so important. Unless they perceive these technological advances not only as non-threatening but also as opportunities, they will not invest the time and resources to become knowledgeable. In years past we could get away with minimum training and educational opportunities for counselors and other rehabilitation professionals. However, we are witnessing a fundamental shift in this country's economy that can be compared with the old Industrial Revolution in scope. We must not be penny wise and pound foolish.

I believe that the offering of training and educational opportunities in computers and computer related technologies to rehabilitation professionals by administrators is an area where there will be great reluctance and resistance. Training of staff has never had a high priority in most service oriented agencies, and it probably has even less priority now that we are experiencing cutbacks in almost all phases of service programs. Yet it is vital that training and educational opportunities in the new technologies be made available to rehabilitation professionals.

--Robert J. Gilmore, Ph.D.

This is an excellent paper which emphasizes the effect of high technology on the rehabilitation process. It examines the impact of high technology on service delivery systems as well as its effect on the management of human resources. The following points are advanced to reinforce the issues presented in the paper. They include:

1. The author makes the point that there could conceivably be resistance to change by the disabled

community to the assistive devices developed through high technology. This is an important consideration because if adaptive devices are not socially/culturally acceptable, the disabled person will **not use them**. In instances where a device replaces human assistance, the disabled person may feel lonely because it may be his/her only interaction with a human being.

2. It should be realized that congenitally disabled persons react differently to technology than post-trauma victims. Disabled persons enrolled in the educational system prior to the special education mandate have largely a "phoney" education. They lack the basic educational background to take advantage of the opportunities afforded them by high technology, particularly in the computer field.
3. Reinforcing the element indicated above, it is absolutely essential that high technology be applied in the **special education classroom** to assist the multiple, severely disabled person to become educationally competent. The introduction of high technology assistive devices in the adult age is "locking the door after the horse has been stolen." We must focus on the primary education of disabled persons and **not** emphasize remedial education during the adult years.
4. There are many disincentives associated with employment which may tend to frustrate the introduction of high technology assistive devices in the employment realm. The point is made in the paper that, in many cases, disabled persons like their able-bodied counterparts show little drive or ambition. This can be directly related to the disincentives associated with employment. The loss of welfare benefits such as those for side and attendant care and housing are significant for the disabled persons when he/she enters entry level jobs at minimum wage. Public policies related to disincentives to employment must be modified if the advantage of high technology are to be completely utilized.
5. A service delivery system encompassing funding, prescription, and maintenance of high technology devices does not exist in the United States today in an integrated form. Funding criteria vary from state-to-state and from insurance company-to-insurance company. An integrated service delivery system, national in scope, supported by federal legislation is necessary to eliminate the real "hassle" in opening and utilizing high technology assistive equipment.
6. The utilization of robotics or FMS (flexible manufacturing systems) will displace many persons in the United States in the upcoming

decades. It is imperative that vocational rehabilitation counselors carefully research high technology jobs of the future so that training can be provided to disabled persons at all levels of education from the secondary special education classroom to college. It does no good to provide high technology functional assistive devices to individuals who will be going to work for organizations already utilizing highly automated manufacturing/service systems. The author does make a good point that many "mom and pop" type organizations will be labor intensive for many years to come. Efforts should be devoted to identify these industries so that training can still be provided in the classical areas of blue collar employment. Large corporations, however, will be largely automated.

7. High technology must be introduced into the sheltered workshop. In the United States, many hundreds of thousands of severely physically disabled and/or mentally disabled individuals work in sheltered workcenters. If the workcenter is to be a vehicle for eventual placement into mainstream industry, the elements of high technology must also be introduced into this environment. Progressive leadership in the sheltered workshop environment must be encouraged in order that high technology can be accessible to a very large segment of the handicapped population.
8. The federal government must make a strong commitment to encourage employers to hire the disabled. The reviewer has testified before several congressional committees recently and was appalled by a vast maze of vested interests seeking to frustrate the employment of disabled persons. Javits-Wagner-O'Day, a federal set-aside subsidy program, has recently been challenged from all sides by vested interest groups representing the able-bodied segment of American society. Without a strong commitment at the federal level to employ disabled persons there is no incentive to do so, in fact, the reverse is true. As a point of information, it has been discovered by many countries that quotas do not work. In Japan, for example, companies are willing to pay fines for the privilege of not hiring the disabled person.
9. The vocational rehabilitation counselor must be encouraged to use technology in the development of placement strategies for his/her clients. Emphasis should be made on the **quality** of placement and not quantity. Counselors must avail themselves of the opportunity to learn about the vocational applications of technology particularly in the vocational realm. It should be realized,

however, that many research entities, particularly those supported by NIHR, are primarily devoted to research and not to service delivery issues. This is an area which should be examined in more detail in order to facilitate the service delivery process.

10. The costs associated with providing adaptive devices for the severely disabled persons can be extremely high. Funding sources for providing adaptive devices for severely disabled persons are a quagmire of contradictions. An integrated concept of funding must be developed on the national level in order to facilitate the provision of high technology devices for the people who need them. The lack of a centralized, integrated service delivery process is, in my opinion, the limiting factor to the application of high technology to the problems confronting severely disabled persons.

-- John H. Leslie

Dr. Pati provides an interesting perspective of the impact of technology on the rehabilitation of people with disabilities.

I would like to reinforce his position that technology will create viable alternatives for people with disabilities that will result in new jobs and careers. Already in business and industry there are many examples of technology enabling persons with disabilities to perform jobs never before thought possible.

The implications of this are significant for rehabilitation professionals. Certainly, as Dr. Pati suggests, rehabilitation professionals must learn about and keep abreast of new technologies. In addition, I see the need for these professionals to make business and industry aware of these technologies and their application to the employment and advancement of persons with disabilities. Business and industry are not normally aligned with the field of rehabilitation and as a result may not be aware of the aids and devices technology is creating to assist persons with disabilities. Without this knowledge business and industry may overlook opportunities to place or advance applicants and employees with disabilities.

Dr. Pati presents a strong case for additional legislation, with adequate enforcement, and a quota system to increase employment of persons with disabilities. I support his view that additional legislation is needed at the Federal level to include those employers not covered by the Vocational Rehabilitation Act. And certainly additional legislation must include adequate enforcement if it is to be effective.

However, I do not share the need for quotas. Although I agree that targets and goals had an impact on the employment of women and minorities in our society, but did so with a considerable human price. A similar objective for persons with disabilities would be very difficult to implement. Just defining who is disabled is often difficult let alone determining if the quota system applied to all persons with disabilities or only those with severe disabilities. A quota system might serve to segregate people with disabilities into separate job categories rather than create mainstream job and career opportunities.

In the 1980's, I believe the attitude of many employers toward employment of persons with disabilities is quite different from that of some employers in the 60's and 70's to employment of women and minorities. At that time some employers chose to ignore the rights of women and minorities, and targets and goals became effective remedies to correct the inequities. Today many employers are receptive to employ persons with disabilities but don't understand how this can be accomplished. The rehabilitation profession has the knowledge and information that employers need to be successful in this endeavor.

In summary, I believe employment opportunities would be enhanced by increasing the scope of legislation as well as mandating a stronger relationship between business and industry and the rehabilitation profession.

-- Jay Rochlin

Innovative methods should be introduced to increase the employment of disabled people in this country, but a quota system **should be avoided** until all other proposed options are proved to be unsuccessful. European experience with quota systems suggest that many temporarily disabled individuals are used to meet quotas and those who are truly disabled often fill only token or showcase positions rather than performing meaningful tasks.

Realistic tax incentives could be extended to all employers, not only those receiving Federal funds. Research should be conducted among employers to determine realistic levels and to identify employer expenses that should be considered, such as salaries, architectural barrier removal, and assistive device acquisition. The past experience with a limited allowance extended to employers receiving Federal tax incentives for architectural barrier removal has been inadequate to impact significantly upon employment.

The most interesting part of the quota system discussed in this paper related to the use of finan-

cial penalties for the acquisition of needed assistive devices. As much as there is a need for such financing, a quota system does not seem to be warranted as yet solely for a technique to gather revenue. Research is also needed to investigate the appropriations of other financing approaches which could be extended to the potential users of the technology. Partial tax credits and Federal loan guarantees are but two methods which have received at least cursory consideration within U.S. Congressional staff discussions. Projected cost and estimated impact upon employment must be adequately explored by rehabilitation research teams.

--Lawrence A. Scadden

Professor Pati's is the third paper I have read in the present Seminar series, and along with my own these have all emphasized one or two major problems foreseen in any attempts to increase the range and depth of rehabilitation services and systems. One of these is the dissemination of information about available technological advances to rehabilitation personnel and to the disabled. A second problem is the transmission of this information to both business and to government. Along with this should go information that will **modify attitudes** about the employability of the disabled in these sectors of the economy.

About the first of these problems I have great hope, especially so long as conferences such as the present one are held and their results published. Concerning the second problem of modification of attitudes, I think Professor Pati's listing of enlightened corporations gives us hope that there are sympathetic ears in business and industry, and their owners are setting examples that more and more companies will follow when they see the advantages that accrue to them when they do so.

--Carl E. Sherrick

Gopal Pati's paper is an excellent treatise on a current subject that is destined to significantly affect the quality and direction of rehabilitation in America for many years to come.

It is so timely it should be required reading for all rehabilitation undergraduate and graduate students as well as active working rehabilitation professionals because of its special application to training and job needs of the disabled. It's the beginning of a new "bible" for rehabilitation in the 80's.

One striking point Pati makes is that society is a constantly evolving phenomenon and at each successive stage of development, such as the agricultural, industrial, and now the electronic age,

a unique and significant change takes place in the way in which society responds to **new forces** at work.

As a result, new knowledge, new technology, new philosophical and cultural foundations are added to our basic knowledge and understanding of our resources. These forces in turn impact on all aspects of society, economic, social, political, to name a few.

Dr. Pati is on the cutting edge of the new revolution that is sweeping the western nations in particular. The noted shift to partnerships, alliances, and cooperatives is gradually replacing the adversarial/competitive philosophy. Projects with Industry that Pati speaks of is an excellent example of the new partnership phenomenon in rehabilitation embracing business, industry and labor unions.

These are, as Pati points out, exciting times for disabled persons as the "electronic revolution" ushers in a new golden age of opportunity and progress.

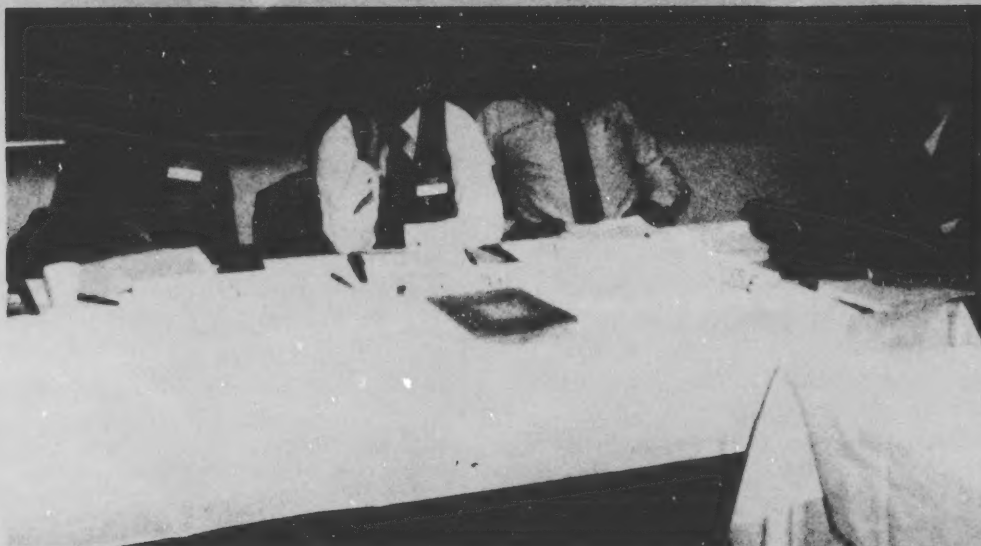
Pati's paper is one of a kind and it is a masterpiece in rehabilitation .

--Angela Traiforos

This reviewer is impressed with the in-depth analysis of the computer age revolution developed by this author. It is indeed refreshing to read the view of Pati which describe the opportunities of this new age in terms of employment and success through the application of technologies for disabled or non-disabled persons alike. It has long been my feeling that equal and fair competition among all the people in the pursuit of meaningful work and the improvement of the quality of life is a must. Pati's views are of course much the same as my own, and I applaud them vigorously.

My major concern with Pati's paper lies in this statement of need for more vigorous legislation which would apply to employers and would require forcing employers to utilize more disabled persons. I, for one, believe that present legislation is producing a backlash against the full employment of disabled persons. If it is true that disabled persons can be employed in an open competitive environment, then I believe training for appropriate jobs and appropriate public education programs will do more than will **further** legislation to improve the quality of life for disabled persons.

--Joseph E. Traub



ABSORBING THE MATERIAL: These four Switzer Scholars were intent on absorbing the presentation of a particular paper during the opening session of the Seminar. Shown, left to right, are Dr. Valerie Ellien, Dr. Robert Gilmore, Dr. Alan Hofmeister, and Dr. John H. Leslie, Jr.



WELCOMING: The George Washington University's Dean of the School of Education and Human Development, Dr. Eugene Kelly, Jr., welcomed the Switzer Scholars to the campus and to the project at hand.

Seminar Scenes



SPECIAL MAN: Few have been more involved over the years than this man, Dr. James Burrows, who worked closely with Mary Switzer and who was on the Switzer Committee from its inception.



A SCHOLARLY VISIT: Joseph Traub, one of the 1983 Scholars, visits with two of the prime movers at NARIC, Executive Director Susan Flowers, center; and Marian Hall, the Director of NARIC's highly-successful ABLEDATA program.



Switzer
Scholar
Sherrick

Chapter Two

Technology and Rehabilitation: Another Viewpoint

By Carl E. Sherrick

Introduction

In thinking about this title for the present conference, I recalled the time, now more than forty years ago, when I began college in an engineering school. Then it was called the Carnegie Institute of Technology, and one of the things in which it took some pride was its requirement that all engineering students take each semester a course that was humanistic in orientation. As a freshman, I had little choice in what aspect of humanism to explore. The result was that much of the content was never learned, much less forgotten, but the one title I remembered in that first course was Stuart Chase's *Men and Machines*.

The intentions of Chase's writing, and that of the humanistic courses in general, were to imbue the budding engineer with the idea that what he or she did (there were women in my classes at the time!) would very likely have some impact on society. It was argued that we would soon be joining the gigantic technological network of the U.S. to further the aims of business and industry, and that our inventiveness and energy would result in products or processes that might in future years have as yet unseen effects on the world and its people.

Even then we were warned that the cost to be computed for a change in method or site of manufacture is not only the profit/loss statement for the fiscal year, but also the accumulated price of the chain of events that follow the change. We have seen the wisdom of their advice as reports of environmental damage accrue. We see the validity of their admonitions to study our technology and

its consequences, with the continuing disturbing news from Three Mile Island.

This is the dark side of technological growth. A bright side exists as well, and it is this of which we speak here. In industry, a major role of the engineer is to increase the contentment of the corporation's cost accountants, whether by increasing profits through improvements in production, or by reducing costs by replacing people with machines. In biomedical or rehabilitative engineering the role of the engineer is to improve the ratio of grasp to reach in the disabled, i.e., to bring them, through technology, into harmony with their environment. It is this kind of impact of technology on society that was only dimly seen in the 1940's.

High Technology and Disability

High technology may be defined very roughly as the application of sophisticated electronic principles and/or devices to the solution of problems. In great part this translates to the involvement of a computer in the gathering, sorting, or transmission of information between person and environment. Probably one of the most visible examples of high technology is in the commercial and military aircraft industries, and as either concerned travelers or concerned taxpayers, we are regularly informed by the newspapers or by magazines published by the airlines of the advancements in flight.

We may learn of the high degree of sophistication of navigational aids, for example, from stories such as the recent tragedy of the Korean Air Lines Flight 7. We become aware of the sensitive and

discriminating powers of the latest radar systems from accounts of aerial warfare in the Middle East. In recent months, there have been reports of the application of Automated Voice Technology to flight tasks, in which the pilot may eventually be able to change a control setting or take a reading by giving a vocal command (Pisoni, 1980). In addition, the accomplishment of the task may be reported to the pilot by a computer-controlled voice!

In recent weeks there have been television reports of the applications of automated voice technology to the problems of a quadriplegic individual: By means of voice commands, the patient was able to get a number of simple tasks performed. In this manner the individual is made independent of a human caretaker for at least a part of the day. When voice recognition devices are combined with robotic arms or even mobile androids, the possibilities for high technology in rehabilitation gain in geometric proportions over those of only a decade ago.

A good example of the achievement of high technology in a field in which I have a special interest is the Kurzweil reader for the blind (Sherrick & Cholewiak, 1982). This device, as most rehabilitation workers know, is designed to "read" ordinary inkprint and repeat it aloud to the listener -- all without the intervention of a second party. The development of this device was greatly facilitated by the happy conjunction of optical character recognition systems, voice synthesizing systems, and the elaborate computer software required to synthesize speech with acceptable English grammar and syntax. The rapidly developing miniaturization of electronic circuits permitted the incorporation of the three systems in a device of a size that could reasonably be maintained in a public library. The final element in this arrangement is, of course, the developer, Kurzweil, who brought about the conjunction of the systems through long hours of applied research and development. Without the researcher bee, there is no technological honey.

High Tech, Low Tech, or No Tech?

Those who have read some of the literature of rehabilitative medicine, or have practiced the art, or have been the subject of treatment, can all report some of the small miracles of technology like those I have mentioned. They can also no doubt report on a dozen or more failures for each success, or (equally likely) instances in which progress in a development effort slowed to a halt and never moved again, for no apparent reason. In other cases we

many find that what would appear to be an obvious and clearly-needed development is slacking: I am reminded of a colleague who required a walker for his young son who was paraplegic. It was discovered that walkers come in sizes to fit small adults, i.e., about five feet tall, but not for children who are three to four feet tall! Needless to say, once my colleague had built the required device, he was sought out by a number of others who wanted the same thing for their children.

Scaling down a walker to fit a child is not really a high-technology project, of course. It is at best what would be called a low-technology application, since it requires no more than simple hand tools, stock materials and manpower (of a skilled level, to be sure) to produce the device. A question that has occurred to me and others in the past concerns our fascination with the so-called high-tech solutions and our resulting neglect of low-tech applications. The result of such neglect is gaps in the materials, means, and measures for overcoming many of the disabilities that rehabilitation workers see day after day.

There are, of course, any number of problems for which there are both high-tech and low-tech solutions. When the time comes to decide which is better, it is not necessarily a matter of which solution an administrator likes better, nor which one has the lower cost/benefit ratio. What may be equally important is how the solution improves the long-term prospects for the disabled beneficiaries, or how the solution affects the development programs of the research group, e.g., as a learning experience for them.

Consider, for example, the situation that exists presently in the field of sensory aids for the hard of hearing. A number of high-technology solutions have been proposed, having in common some sophisticated electronic systems for processing airborne speech sounds and converting them to a variety of electronic signals. The solutions differ generally in how these signals get displayed: A number of otological surgeons here and abroad have arranged to implant such systems in the head of the patient, with the final stage of sensory input being direct electrical stimulation of the auditory nerve (Keidel & Finkenzeller, 1983; Parkins & Anderson, 1983). An alternative to this is the visual display (see, e.g., Levitt, Pickett, & Houde, 1980). One type involves a portable display that is worn on the glasses (Gengel, 1976; Upton, 1968), and that acts to supplement the information gained through lipreading.

A second alternative to the cochlear implant system is the tactual display, with which I have

recently been greatly concerned (Sherrick, in press). A variety of devices have been developed to achieve the general aim of displaying at least a part of the information in the speech stream to the subject as vibrotactile stimuli to the skin. In this mode, as in the visual, it is often assumed that lipreading will accompany the use of the device. Nevertheless, there have been designs suggested for the tactual device that are intended to make it the sole input channel for speech. Thus, for example, the device could be used by persons who are both hard of hearing and blind.

In its configuration as an aid to the deaf-blind, the tactual display system would be considered a very high-tech device, because it must process as much speech information as the ear does. The fact is, of course, that we have no device at present that possesses the sensitivity, discriminative capacity, and pattern recognition capabilities as good as the human auditory system. The auditory aids I have described do about as well in their way as a wooden peg does in replacing the lower leg and foot.

When we examine the statistics on the number of persons fitted with the various speech understanding aids, we find that more than 500 persons have the implanted aids, whereas only a handful of people have the visual aids, and an equally small number the tactual aids. I have tried to explain this disparity in consumer statistics elsewhere: Briefly, the cochlear implant is the surgeon's solution, amounting to an attempt to restore the auditory function by supplying an electronic equivalent to the elaborate mechano-electro-chemical system of the natural ear. The attempt is successful to the extent that the patient reports restoration of a sensation of hearing. Problems still persist, however, in the acquisition of the skill of understanding speech over the restored channel for most patients. Current research is focusing on two problem areas, viz., more elaborate neural stimulators for better simulation of the neural analysis process, and more complex speech analyzers at the input end of the device.

Inasmuch as the surgeon is strongly disposed to replace the lost function by restoration of the organ, it is not surprising that only a few medical personnel have experimented with the substitution of the visual or tactual modalities for the auditory (see, e.g., Fourcin et al., 1979). The result has been that these aids have not been developed for application to a patient population. Instead, the typical form of development of substitution aids that takes place is that of an experimental device that models the hearing function in a more or less limited manner. It is then studied for its fidelity for the transmission (or transmutation) of speech. It may then be

tried out with a small sample of hearing or deaf persons to see whether they can show a gain in information through its use in a controlled testing situation. Very commonly, the testing is limited in scope and total time, except on rare occasions (see e.g., Brooks & Frost, 1983; Engelmann & Rosov, 1975). Thus, the medical-surgical approach garners a number of committed, interested patients, whereas that experimental-educational approach may generate at best reports a partial success, but no stable and dedicated "user group."

At present it is not possible to say which patient should receive which aid, but the procedure generally followed for implant surgery is a screening process that leaves a final list of candidates who would most likely do well with the implant prosthesis. Those who have been screened out would presumably be well advised to examine the sensory substitution alternatives. The variety of aids available is not exhausted by the three general types outlined: There is, in fact a kind of medium-technology tactual aid for which there exists evidence of some utility to a particular group of hard-of-hearing persons. This device simply converts vowel sounds to palpable mechanical vibrations so that the deaf person can pick up some information from the speech stream via the tactile system. There is experimental evidence that a simple tactual aid such as this will improve significantly the understanding of speech by some deaf persons (Beguesse, 1976; Reed, Durlach, & Braida, 1982). As with all other aid systems, however, further research with a population of active users is required before we are in a position to prescribe with certainty a specific system, for specific hearing disabilities in particular patients.

Basic Research, Applied Research, and Technology Transfer

It is often mistakenly assumed that once the sensory or motor prosthesis is developed, the job is to put it into production and distribute it as one might do with a prescription drug. Even the most familiar of the prostheses require some instruction in their use, e.g., eyeglasses, contact lenses, hearing aids, canes, or even dentures. With more complex information processing systems the training time becomes longer. For some devices still in development the time is as yet unspecified. It is known that learning to differentiate rapidly the tactual patterns in braille characters may take several years.

As devices become more and more complicated in their function, and their use requires more skill and practice, straightforward instructional pro-

cedures may be inadequate, and there may then need to be done research to determine more effective ways of presenting task demands and information to the trainee. Here, the technological achievement forces the practitioner to query the researcher in education for answers: The result may be the appearance of a new venture in basic research, owing to the fact that the investigator can find no acceptable evidence for one or another choice of a training procedure. It is not uncommon for such problems to arise in the context of development of products or processes. Conversely, it is often the case that a technological development is recruited to the service of basic research. The Optacon, which was developed (from a series of basic and applied research ventures: see Craig & Sherrick, 1982) to aid the blind in reading inkprint directly, and perceiving it as a tactual display, has been an instrument of great utility to investigators concerned with the basic problem of perception of tactile patterns in humans and animals (see Craig, 1980; personal communication; Green, Craig, & Pisoni, 1983).

It is common to speak of technology transfer in discussing the proposal of a particular rehabilitation engineering center, or of a specific device or procedure. What is meant, as I understand it, is the movement of a developed device or system from the research site to a place or position that will permit its production and distribution by a supplier to the target population in the rehabilitation network. Sometimes what is not transferred is an adequately detailed and systematic set of procedures for the use of the device for testing its performance, or for its repair. We see this complaint very commonly today among our colleagues who have purchased a personal computer (PC) for home or office use. They speak of "user-friendly" software and hardware, and lament the "unforgiving" behavior of the computer that destroys many lines of text because one key was inadvertently bumped. Competition in the computer business is fierce, and PC's are getting friendlier by the month. A similar problem exists in devices and procedures in rehabilitation: "User-friendliness" should mean that a trainee will persist in striving to acquire the needed skills with the system because the device works, and because the design of the training procedures was carried out to optimize the user's understanding of the system as well as to provide the appropriate rewards and feedback over the training periods. This may include specific instruction to the trainer on how to behave toward the trainee, by the way.

To improve the chances for the appearance of user-friendly systems, I would suggest that persons with

experience in human factors research be invited to examine the proposed technological developments.

Summary

The present paper has attempted to illustrate some of the problems of research and development of devices intended to aid the disabled to overcome the impediments of the environment. Among points that were stressed were the following:

(1) High technology solutions are frequently dramatic and exciting to the public, but they can be costly in money, development time, and transfer time.

(2) Low or medium technology solutions may be preferable if they are faster, more cost effective, or bring the user into a closer relation to the social and physical environment.

(3) Decisions about the technology solution of choice may also be influenced by their anticipated effects on research and development programs. Other things being equal, the solution that nourishes a good ongoing research effort would obviously be the one to favor.

(4) An important part of the transfer of the device or procedure to the rehabilitation system is the supporting technology of training, testing, and maintenance of systems. Neglect of this aspect can seriously impede proper use of the system.



(Preparation of this paper was supported in part by a Grant from the National Institute of Health, DHHS, No. NS 04755, to Princeton University.)

References

- Beguesse, I.M. A single-channel tactile aid for the deaf. Unpublished Master's Thesis, Massachusetts Institute of Technology, 1976.
- Brooks, P.L., & Frost, B. Evaluation of a tactile vocoder for word recognition. *Journal of the Acoustical Society of America*, 1983, 74, 34-39.
- Craig, J.C. Modes of virotactile pattern generation. *Journal of Experimental Psychology: Human Perception and Performance*, 1980, 6, 151-166.
- Craig, J.C., & Sherrick, C.E. *Tactual perception: A sourcebook*. Cambridge, England: Cambridge University Press, 1982, 209-233.
- Engelmann, S., & Rosov, R.J. Tactual hearing experiment with deaf and hearing subjects. *Journal of Exceptional Children*, 1975, 41, 245-253.
- Fourcin, A.J., Rosen, S.M., Moore, B.C., Douek, E.E., Clarke, G.P., Dodson, H., & Bannister, L.H. External electrical stimulation of the cochlea: Clinical, psychophysical, speech-perceptual, and histological findings. *British Journal of Audiology*, 1978, 13, 85-107.
- Gengel, R.W. Upton's wearable eyeglass speechreading aid: History and current status. In S.K. Hirsh, D.H. Eldredge, I.J. Hirsh, & S.R. Siverman (Eds.) *Hearing and Davis: Essays honoring Hallowell Davis*. St. Louis, MO: Washington University Press, 1976, 175-190.
- Green, B.G., Craig, J.C., & Pisoni, D.B. Vibrotactile communication of information about consonants: Vowels mask consonants. *Perception and Psychophysics*, 1983, 33, 507-515.
- Keidel, W.D., & Finenzeller, P. (Eds.) Symposium on artificial auditory stimulation. Erlangen, W. Germany, Sept. 29-Oct. 2, 1982.
- Levitt, H., Pickett, J.M., & Houde, R.A. (Eds.) *Sensory aids for the hearing impaired*. New York: IEEE Press Selected Reprint Series, 1980.
- Parkins, C.W., & Anderson, S.W. (Eds.) Cochlear prosthesis: An international symposium. *Annals of the New York Academy of Sciences*, 1983, 405.

Pisoni, D.B. Perception of speech: The human listener as a cognitive interface. *Speech Technology*, April, 10-23, 1982.
Reed, C.M., Durlach, N.I., & Braida, L.D. Research on tactile communication of speech: A review. *ASDHA Monographs*, No. 20. Sherrick, C.E. Basic and applied research on tactile aids for the deaf: Progress and pro-

spects. Washington, D.C.: Academy Press (in press), 1982.
Sherrick, C.E., & Cholewiak, R.W. Can touch replace a missing sense? *The Princeton Engineer*, 1982, 43, 19-22.
Upton, H.W. Wearable eyeglass speechreading aid. *American Annals of the Deaf*, 1982, 113, 222-229.

Excerpts of Reviews and Comments

The following are excerpts of reviews, comments and questions raised by the Switzer Scholars. These are presented to further stimulate thinking, discussion and action as it relates to the content of Chapter 2 by Carl E. Sherrick.

Professor Sherrick has provided us with some unique insight into the reason for research, development and training into the world of technology design, development and transfer for persons with disabilities. His positions of course comes from the viewpoint of engineering and psychological research and training and his long association with disabled persons.

This reviewer supports Sherrick's views, and particularly agrees with his assessment of the transfer of technological systems. The requirement that step by step instructional materials for users of technology is extremely important if such systems are to be user friendly and therefore accepted. Without such transfer mechanisms, useful and functional systems often flounder and are not effectively utilized by disabled persons or professionals serving them.

There is one point that I believe Sherrick should have stressed, but didn't. This relates to the perceived and actual cost effectiveness of technological systems. When systems are conceived and developed, careful analysis must be made of cost to develop and produce such systems. The results of these analyses, must then be weighted against the potential benefits/effectiveness of these systems in use. If the benefits are more than the cost when spread out across the entire market, in terms of increased earning potential or reduced maintenance costs of disabled persons, then the technology can be deemed cost-effective. In this instance it is felt that more third party payors will be more likely to purchase such equipment for their clients if there is a clearly demonstrated cost-benefit ratio applied.

-- Joseph E. Traub

Technology and Rehabilitation by Carl E. Sherrick is a technical, professional paper attempting to capture technological devices and adaptations on instrumentations for normalizing disability in

disabled people. It covers blind and deaf individuals and others to a lesser extent, points out the state of the art in technology advancement. Although it acknowledges some important milestones, it points out technology for the blind and deaf are still relatively premature. Sherrick, however, is optimistic that the revolution in electronic technology will significantly improve the quality of life for the disabled in the years ahead.

Perhaps the greatest revolution in the management of disability will come about not by technology, but rather by biological breakthroughs and in the prevention area by advances in biological and genetic engineering.

Sherrick's paper from purely a technological viewpoint is excellent and a commendable addition to rehabilitation literature. It might well be worth speculating that gigantic progress in the management of disability will come about by a combination of technology and biological engineering.

--Angela Traiforos

Dr. Sherrick makes an excellent contribution with his position about high-tech vs. low-tech. For me this issue is summed up in his statement, "our fascination with the so-called high-tech solutions and our resulting neglect of low-tech applications."

I am not opposed to using high-tech solutions when necessary to accommodate persons with disabilities in employment situations. But often, inexpensive low-tech accommodations will suffice. Rehabilitation professionals need to emphasize the inexpensive low-tech solutions with business and industry to counter the belief that accommodations for persons with disabilities are expensive.

In addition, improved means of disseminating information must be developed to communicate both high and low-tech solutions to business and industry. This information is absolutely essential for business and industry to accommodate applicants

for employment as well as providing upward and lateral career opportunities for employees with disabilities and returning to work employees who have become disabled.

The introduction of high-tech aids and devices to accommodated employees with disabilities created another problem that needs to be addressed perhaps by legislation. The issue concerns the cost of maintenance and repair of aids or devices and who will assume this expense, the employee with the disability, the employer or the rehabilitation agency.

Often maintenance and repair of high-tech aids or devices can result in considerable expense for either the employee or the employer. Currently few rehabilitation agencies will assume this expense. The solution may require legislation that provides for either rehabilitation to assume this cost or tax credits, if the employee or employer pays the expense.

-- Jay Rochlin

Carl Sherrick wrote an insightful, sensitive paper describing the internal, scientific perspective of engineering in rehabilitation. More professionals like him are needed in rehabilitation. Basic research and concern for application must be fostered. Sherrick shows interest in both. His work should be applauded. He should be encouraged to communicate more of his ideas to the rehabilitation community (professional and consumers).

Some spin-off ideas that were inspired by this paper include:

1. The notion that counselors/placement specialists need more direct knowledge of new devices for:
 - 1) Recommendations to purchase or acquire;
 - 2) Advice on job adaptation/modification;
 - 3) Assistance in client adjustment in use of devices and maintenance.
2. We should encourage parents or consumers with specialized expertise to develop new devices or adaptations. They are naturally motivated. Professionals should encourage their involvement.
3. We need to encourage more **teamwork** among VR-medical-technical personnel.
4. Rehabilitation training programs must involve research engineers and their research results in the education of counselors.

--Donald C. Linkowski

This is an excellent paper which presents several case studies related to high technology solutions for

blind and hearing impaired persons. The author makes several points that the reviewer would like to highlight. They include:

1. Many vocational and independent living problems confronting severely disabled persons can be solved by relatively low technology applications. In most cases, congenitally disabled persons are extremely poor and unsophisticated. They cannot afford the cost of maintenance of complicated devices and **may not** understand the fundamentals of their operation. The guiding principle for adaptive equipment, particularly devices to be utilized by severely disabled persons is, "if it works it has a lot going for it." Simple devices are **less costly** devices. This is an important criteria, particularly for the congenitally disabled persons who is traditionally poor.
2. The author's emphasis on new techniques of training for disabled people to use assistive devices is a good one. Individuals, particularly those living in rural areas, may receive an adaptive device in the mail with little or no instructions as to its proper use. As devices become more complex, adequate training of the disabled person for the appropriate use of the device becomes extremely important. Assistive devices, whether they are high technology or low technology must be relatively cheap, easy to trouble shoot and repair and, more importantly, understandable for the person to use.
3. The transfer of high technology from the laboratory to the market place is an area that, up to the present time, has **not received** enough emphasis. It is imperative that the results of numerous research efforts around the country get to the ultimate consumer, **the disabled person**. At the present time, many meaningful assistive devices become just a "carrot" dangled in front of the person who desperately needs it.

--John H. Leslie

Dr. Sherrick reminds us that while we in rehabilitation may be preoccupied with the promises and potential of the new technologies, we must not neglect low and medium technology that may provide immediate benefits to disabled persons. Improvements are still needed in low and medium technological devices and should not be delayed until higher technological devices become available.

One area we tend to forget, which Dr. Sherrick

points out, is that the more sophisticated the technological advance the more complex the training that may be required for both the disabled person and rehabilitation professionals. Dr. Sherrick states, "As devices become more and more complicated in their function, and their use requires more skill and practice...there may then need to be done research to determine more effective ways of presenting task demands and information to the trainee."

In any technological development there is always the tendency to be preoccupied and fascinated with the machines and devices and to **forget the persons** who operate and use them. In order to improve the chances for the appearance of user-friendly systems, I strongly concur with Dr. Sherrick's suggestion that persons with experience in **human factors research** be invited to examine the proposed technological developments and provide their expertise.

--Robert J. Gilmore

A review of this paper brought to mind five categories in which technological advances can be identified. These include technological advances 1) **specific to a disability group**. For example, telecommunications devices for hearing-impaired persons are designed to accommodate the hearing-impaired population as a whole. The Autocuer, a portable

minicomputer mechanically "hears" words spoken to a deaf person and projects symbols onto the lens of a pair of glasses worn by the deaf person. This device was not developed for any one deaf person, but for all deaf persons capable of utilizing it; 2) **customized for an individual person with a disability**; although most assistive devices are designed to accommodate many, some must be custom designed for individuals because of individual differences; 3) **designed to serve the general public**, but in effect creates accessibility to certain areas previously closed to persons with disabilities. Some are taken for granted such as the automatic door. Though designed for the convenience of the general public, the automatic door is an assistive device for persons with physical mobility impairments; 4) **designed to assist rehabilitation practitioners**. For example, Distributed Data Processing (DDP), is a means by which counselors can spend less time on mechanical aspects of their jobs and more time counseling and coordinating; and, 5) **designed to assist management**. The existence of computer technology for improved Management Information Systems (MIS), Decision Support Systems (DDS) and other planning and decision tools are examples of technological advances in this area.

--Ted M. Daniels

Summary of Recommendations

The following is a summary of the recommendations and implications for action developed by the Switzer Scholars as they related to the topics of the first and second chapters. (The recorder was Willman Massie).

Working definition of high technology

In almost every case, the technologists are attempting to replace or simulate the functions of a human being, e.g., elaborate sensing systems such as light and sound energy devices, and motor devices (robotic arms) and memory devices (computers) that can do repetitive actions as well as program sequences of sensory motor functions.

1. Recommendations/implications that would enhance service delivery:

Develop appropriate and useable information systems for counselors. The system could be used to (1) track the implementations of the rehabilitation plan for the client; (2) readily identify available jobs in the community; (3) list the support systems and services in the community.

2. The Rehabilitation Services Administration (RSA) and the National Institute on Hand-

icapped Research (NIHR) should investigate the possibility of each having a full-time person in the area of the new technologies. Federal leadership and guidance would certainly be appropriate from these two important governmental programs.

3. Recommendations/implications for training of staff/the general public, etc.

Training programs should be developed and offered so rehabilitation emphasis should be given to these matters: (1) the material should be presented in language which can be readily understood; (2) there is no intention for the technology to interfere with the relationship between the counselor and the client; (3) the technology does not constitute an attempt to replace counselors, and (4) properly developed and utilized information systems can increase the effectiveness and efficiency of the counselor.

4. Recommendations/implications for needed research:

- a. All programs of operational (applied) research should have a carefully built in self-evaluation system.
- b. Each research proposal should reflect a substantial effort to identify related types of research.

5. Recommendations/implications for legislation -- Federal, State, local:

- a. The Civil Rights Act should be amended to include persons with disabilities.
- b. Quota systems should be considered as an additional strategy for the employment of more persons with disabilities.
- c. A tax-benefit system for employers should be reviewed and initiated to encourage the employment of more disabled persons.



Switzer
Scholar
Scadden

Chapter Three

Employment and Training Opportunities for Disabled Persons in the Computer Age

By Lawrence A. Scadden

Computer technology is rapidly changing the appearance of the American workplace, the characteristics of employment tasks, and the skills needed by the evolving labor-force. These changes will be even more dramatic in the final years of this century. Disabled workers -- equipped with the appropriate means to access this computer technology and the prerequisite vocational training -- will be able to compete in the emerging employment sphere better than at any time in history.

The roots of the changing employment picture preceded the emergence of the computer as a common industrial and business tool. They are buried in economics rather than technology. Computers became a means to facilitate change rather than to initiate it. For nearly three decades, social scientists have been heralding indications that the 1300 year old industrial age was near its end. In 1957, for the first time in this nation's history, white-collar workers equalled blue-collar workers in number (Naisbitt, 1982), and soon the "knowledge" workers were in the majority. Many factors contributed to this shift. An increasing number of individuals in business and industry were engaged in administration, design, and clerical activities; and, an increase in productivity provided by early automation decreased the demand for manual labor. Simultaneously, the nation was experiencing a rapid growth in service industries and governmental employment. Finally, American industries were relying more and more heavily on less expensive foreign labor for numerous manufacturing tasks.

It must be remembered that in 1957, computers were just beginning to make important contributions to science and to some businesses. The microprocessor -- the computer on a "chip" that now lies at the heart of all computer-controlled appliances, games, automobile systems, and electronic assistive devices -- was not to appear for another decade. Thus, the change in the make-up of the labor-force certainly preceded the age of the now ubiquitous computer.

Many names have been applied to the emerging economy and the social and cultural society associated with it. These include: post-industrial, super-industrial, and the space age; but the most widely accepted today, and the most appropriate, is that of the "information age." The majority of the time of knowledge workers is spent in the creation, processing, and distribution of information.

The computer in general, and the microprocessor specifically, have revolutionized the emerging information age by facilitating the ease and speed of information manipulation and by providing an increasing amount of service and entertainment.

The microprocessor is also used to control assistive devices used by physically disabled individuals both to enter data into computers and to obtain usable information displays. These devices frequently are termed "access technology" as they provide independent access to the storage and transmission of electronic information for physically disabled individuals.

As will be described and discussed more fully later, the new society will be filled with electronic

information. For able-bodied individuals, the standard keyboard or interactive screen will provide data entry and the common cathode ray tube (CRT) video display screen will present the printed information. Motor impaired individuals, however, require specially designed data input equipment while visually impaired individuals will be able to view only magnified characters on these screens produced by specially developed computer programs; and sensory aid braille and synthetic speech displays will be needed by blind people. Computers neither have prejudice nor preference. Computer access technology and appropriate software can provide a significant degree and equality for disabled people in the information society.

The following pages will present forecasts for the information society, employment and training implications for disabled people and a description of activities which must be undertaken by the rehabilitation community for the purpose of ensuring the highest level of equality in employment at the dawning of the 21st century.

As understanding of the implications for employment of disabled individuals in the emerging information age must be based upon an appreciation of changes which can be expected in the economic and cultural structures of modern society. The new age -- as is the preceding agricultural and industrial eras -- will affect the shape and course of economics, employment, education, philosophy, and virtually all other social and cultural institutions. The culture and institutions of the industrial age mirrored the primary unity of its economy, the factory. With the decline in importance of the factory along with its mass production of goods, there will be a parallel decline in the structures and attitudes associated with it and with the industrial age in general.

Toffler, in his **The Third Wave** (1980), documented the industrial age. The philosophy and beliefs which served as the foundation for this age dramatically affected the people who left the farms for the cities. According to Toffler, the industrial society was based on the well accepted premise that the machine and the factory represented the most advanced and efficient means to accomplish the goal of mass production of goods. Predictability, reliability, repeatability, and synchronization were considered crucial for maximum attainment of manufacturing objectives. The factory, to be highly productive, had to be, like the machine, well "oiled." The resulting factory structure included the following characteristics: an organizational hierarchy created by the division of labor with its inherent class privileges and responsibilities, specialization with its roles and expectations, and standardization

with its uniformity and conformity. The relative importance of these attributes, however, has declined recently in all areas of our culture paralleling the ebbing dominance of the factory system and of manufacturing in the nation's economy.

Naisbitt (1982) in **Megatrends** documented many of the statistically measurable employment changes occurring in the past three decades. Four highlights from this important book are included here.

(1) According to Naisbitt, in 1950, 17% of the American labor-force worked primarily with information compared with today's 60% or more. Further, this latter figure does not include the many people who work with information within manufacturing firms such as draftsmen, accountants, and clerical personnel.

(2) Naisbitt quotes Birch of MIT who reported that today only 13% of the national labor-force is directly engaged in manufacturing related tasks.

(3) During the seven year period ending in 1976, the nation added nine million workers to the national labor-force, but the overall size of the work-force for the country's Fortune 1000 largest industrial concerns remained constant.

(4) In the 1970's, nineteen million new jobs were created in the United States, but only 5% of these were in direct manufacturing and 11% in the goods producing sector altogether. In other words, nearly 90% were not in the goods producing sector. Naisbitt again quotes Birch who said, "We are working ourselves out of the manufacturing business and into the thinking business."

Another important aspect of these changes relates to the ever increasing use of electronics in the creation, processing, and distribution of information. The importance of the computer in these activities is accelerating. Predictions differ widely regarding the magnitude and timing of the computer's impact upon the labor-force. Naisbitt (1982) quoted one forecaster who estimated that 75% of all jobs would require computers by 1985. Most other labor market forecasters, however, are much more conservative, but even they agree that at least 60% of the nation's jobs will employ a computer in some activity by the year 1990. Even with wide discrepancy in these predictions, it is clear that, soon, people who cannot interact successfully with a computer will be at a disadvantage in employment. Thus, it is essential that all necessary provisions and training be made available to disabled individuals in the future. It means that appropriate, high quality computer access technology and support software be developed and distributed and that these individuals be provided access to educational and training programs which are capable of preparing

these people for the employment world of tomorrow.

Predictions regarding the future use of computers in employment are frequently misunderstood. It is essential to emphasize that these forecasts certainly do not suggest that each person who uses a computer on a job will have to perform programming tasks. On the contrary, an ever smaller proportion of people using computers will have the ability or the inclination to learn how to write a computer program. The term "friendly" is customarily applied to computer programs which permit uninitiated individuals to be led by the computer step by step through a process which results in a productive conclusion. More and more, computer related activities are becoming "friendly". Without question, computers would never become widely accepted if programming was a prerequisite. Computer literacy is a term which currently refers to becoming familiar with the elementary operation of a computer, often including an introduction to simple programming. Future computers can be expected to come equipped with applications programs, the "software", which are self instructing. The term "computer literacy" may well vanish from our standard lexicon as quickly as it appeared.

Although futurists refer to the end of the "industrial age", it is actually recognition of the decline of the dominance of mass production, manufacturing industry -- albeit, the social and cultural characteristics associated with the industrial age appear to be collapsing, bringing the close of the industrial society. Industry will continue, but different industries will flourish, bringing with them new economic power and political alignments.

Four clusters of industry have been identified by Toffler (1980) as anticipating rapid growth in the coming decades. These industrial clusters are briefly discussed below.

(1) The electronics and computer industry is already rapidly becoming one of the largest industries in the world., Steel, automobiles, and chemicals are the only industries which are larger. By the end of this decade, the world's electronics and computer industrial cluster should top the \$400 billion mark. Communications will continue to flourish as a significant part of the growing electronics industry.

(2) The space industry should also grow rapidly as other industrial sectors, especially manufacturing and chemicals, take advantage of the unusual environmental conditions provided in space stations. Complete vacuum, extreme temperatures, and lack of gravity are all conditions which facilitate the production of many chemicals, alloys, and

drugs. It should become less expensive to use the natural environment of space for manufacturing these products than trying to reproduce them on earth.

(3) Oceanographics is another industry which should grow significantly in the future as scientists attempt controlled growth and harvesting of exotic food sources and for tapping the mineral, energy, and fresh water resources existing beneath the ocean floor.

(4) Biological industries are among the fastest growing industries today. The study of genes, microbes, and enzymes for disease irradiation, control, and monitoring of manufacturing activities, and production of new materials all will rely heavily on new controlled biological processes. The controversy surrounding the ethics and hazards of some of these endeavors is not an issue to be considered in this discussion; it must suffice to point out that the biological industry will be one of the large employers of the future.

These four industrial clusters which will provide the backbone of the future economy emphasize the role of knowledge workers, individuals who will use computers for the creation, transmission, and monitoring of symbolic information. Disabled individuals have the opportunity to compete fully in all of these activities given the appropriate information access technology and adequate educational and vocational training. Even the "non-knowledge" workers of the future will require access to computerized information. Manufacturing is already becoming computerized with the increase of the processes called "computer aided design" and "computer aided manufacturing", CAD-CAM. These workers will have the responsibility of monitoring computer activity -- displayed visually, auditorially, or even tactually. Many of these latter repetitive processes should be within the performance capabilities of many multi-handicapped disabled individuals given the appropriate displays and response systems. Toffler (1980) said that many such manufacturing activities could be performed by functionally illiterate individuals because speech output computers would lead the operator through a process step by step, and for those with sight, pictorial displays could supplement these instructions.

For the knowledge worker, the raw materials of work are alphanumeric characters and other forms of symbolic data to be used by electronic devices. The products of their labor are ideas, plans, correspondence, program, files, formulae, sales presentations, invoices, graphs, specifications, briefs, and patents. These symbols and products may appear on paper; but increasingly, they will be viewed on

video screens, heard through synthetic voices, or felt on tactile displays. Data will, for a long time in the future, be entered primarily by use of a keyboard, but there will be a steady increase of information input through interactive touch and light sensitive screens and by spoken language.

The "paperless" office will not be here for some time, but its vanguard is present today in many industries and even in the more advanced governmental agencies. Optical scanners are being used to read printed material into computers for storage and for enhanced search and retrieval operations. The word-processor, which only a few years ago was considered a luxury, is standard office equipment and is now being used widely for intra-office transfer of documents and memoranda to other electronic terminals. These systems, attached through telecommunication networks, provide the basis for electronic mail and remote work activity, the foundation of telecommuting to be discussed later.

By the year 2000, electronics should provide the primary means for data input, transmission, filing, and display both for business and personal use. Electronic mail will eliminate the need to rely solely upon the slow, expensive, and inefficient alternative of using the public postal service. Speech recognition systems -- which are improving but are still restricted to disconnected speech and to limited vocabularies -- should provide nearly total, unlimited continuous speech recognition for information input within 20 years. At that point, according to Toffler (1980), with speech recognition input devices and computerized dictionaries, executives should be creating most of their own documents, although he adds that no one knows now where the jobs will come from for the clerical typist of that time.

With electronic devices and telecommunication systems, millions of jobs, because they involve information, could be performed from home or other remote locations. A microcomputer and a telephone link is already sufficient to tie many workers to central office facilities. Working at home in the "electronic cottage", as it has been called by Toffler (1980) and Deken (1981), has many economic and environmental advantages (Toffler, 1980) and may, according to Booz-Allen and Hamilton, a leading management consulting firm, stimulate higher worker morale and job satisfaction thus possibly enhancing productivity and creativity. These benefits will accrue from energy and time conservation and reduced pollution resulting from fewer daily commuters. Industries and businesses have had to pay higher salaries and wages to attract

quality workers from suburbs, and these additional expenses have been passed on to consumers through higher prices and fees. These overhead expenses could be reduced along with real estate and utility costs by implementing increased use of the "home work" concept.

As early as 1971, The Institute for the Future reported several categories of work which could be transferred to the home given the appropriate telecommunication technology. These included tasks generally performed by secretaries, engineers, draftsmen, computer programmers, and many other white-collar and managerial personnel. It must be noted here that all of these job categories can now be performed competitively by disabled individuals using appropriate computer access technology.

Studies performed internally by a Hewlett-Packard plant in the United States and a pharmaceutical firm in Canada produced estimates, again reported by Toffler (1980), indicating that between 35% and 70% of the industries' work could be performed from home if the companies were willing to invest in the necessary telecommunication equipment. The cost of commuting is rising while the cost of telecommunication equipment is falling. At some point, the two cost curves will cross; and at that time, telecommuting should increase in popularity with business organizations.

The anticipated large number of business and industrial employees working out of their homes will be added to an already significantly large number of self-employed individuals who have for years operated modern "cottage industries" specializing in contractual and fee-for-service businesses. These latter have included architects, designers, lawyers, investment counselors, consultants of all kinds, salespersons, and construction and repair personnel, among others. It should be pointed out that the vast majority of these occupations are rapidly expanding today. The number of categories and the number of individuals employed in them will increase significantly in the information society as the "electronic cottage" proliferates. Physically disabled individuals certainly can perform competitively in all of these home-based businesses, especially those which are steeped in the creation, processing, and transmission of electronic information. Further, the electronic cottage concept eliminates concern about independent travel. This fact should be mentioned even though it is not an issue for most disabled people, but it remains at least a secondary concern for many severely mobility impaired persons.

Futurists disagree as to the probable popularity among the labor-force of the "electronic cottage", or "home work". Naisbitt (1982) believes that most workers will want the social environment provided by a central office setting. Toffler (1980), on the other hand, believes that increased family ties, volunteer participation, and increased neighborhood and community involvement will provide the needed interpersonal contact. The decentralization of employment will be a gradual process. Jones (1982), in the Washington Post, estimated that, in 1990, there will be 15 million people working at home in the United States, approximately 13% of the national work-force. No matter how rapidly a shift in locus occurs, it is clear that a viable option has been added to the workplace. Disabled people have the opportunity to take full advantage of this option and, among other things, avoid the biases encountered in many personnel offices. This option certainly is not ideal for all disabled people -- just as it is not for able-bodied people -- but the availability of multiple options represents a positive step in the rehabilitation process.

A larger form of the "electronic cottage" is already beginning to spring up all over the country. These are small businesses often starting in someone's home but expanding to include other people with complementary skills. These small businesses primarily sell white-collar type work services to larger firms. With the growth of the home computer industry and telecommunication technology, there will be an increase in the number of these firms and the demand for their services. Toffler (1980) said that these businesses will provide services such as the design of new products, the handling of paper-work and files for hospitals and other institutions, scheduling for commuter airlines and other transportation services, data processing services for accounting and payroll departments, preparation of catalogs, operation of technical information services, and marketing. Other small businesses will arise to provide management services to large firms for the organization, training, and managing of teams of home workers. Two or more such small firms probably will eventually associate with one another to provide each other support services and to obtain beneficial group consideration for quantity procurement of supplies and for medical coverage. These services would also be cooperatively managed by a small firm.

The establishment and management of independent small businesses, or employment within them, must be considered to be viable employment op-

tions for disabled people now and in the future. The entire possibility for, and the anticipated success of, decentralized compensatory work is based on the fact that most work activities will involve the manipulation of information by means of computer technology. Appropriate computer access technology will provide the necessary computer input and output capability for disabled people making this expanding employment sector fully accessible to them. Changing employment options and the availability of technology will provide not only increased diversity of work opportunities but also the possibility of facilitating reasonable accommodation for many jobs in both home and office settings. Disabled individuals should be able to move freely within the emerging employment scene which will emphasize individuality. Aldous Huxley, in *The Brave New World*, described a society controlled by science and technology, a society which was dehumanized and uniform. At this point in history, it appears that the proliferation of science and technology is leading instead to increased diversity, individuality, and the personal selection from multiple options. A society of this latter kind will be beneficial to disabled populations.

Computer technology is also becoming very important in educational and training programs. One area in which this is just becoming evident relates to "home study." Home study, or "distance" education, is on the rise nationally. The National Home Study Council formerly was comprised primarily of institutions geared to promoting completion of elementary and secondary education. Now, programs are available which will permit home instruction leading to advanced degrees and professional certification in a large variety of fields. Increased use of the computer and extensive data bases are providing even greater ability for a student to receive interactive instruction and to conduct exhaustive research of literature from a remote location. It is currently estimated that half of the formal educational services offered in the year 2000 will be provided external to a central campus by means of "distance" education techniques.

Commerically available software for personal computers provides interactive instruction and tutoring in a growing number of disciplines. Such computer programs will greatly facilitate home education and alternative school programs and supplement "distance" education.

The computer is important in the educational innovations mentioned above, and this importance is certainly to increase. Physically disabled students using appropriate computer access technology can participate fully in most of the curricula -- although

special adaptations in some software will be needed. For example software which is highly graphic in format or which is pictorial in nature will require modification for presentation to blind students using synthetic speech or braille displays. Without the necessary computer technology and occasional modified software, disabled individuals would not be able to avail themselves of the vast opportunities afforded by these educational and training alternatives.

The proliferation of computer technology will also produce negative effects in the employment world. These will be coupled with the increased demand by workers to be engaged in "meaningful" or "psychologically" fulfilling activities. Toffler (1980) pointed to the last fact as one of the great ironies present even when unemployment rates were rapidly climbing in the country, and most authorities agree that a shortage of jobs will continue for the remainder of this century (Broder, 1983).

David Broder stated that computer technology and robotics are threatening to produce a split in the American labor market into two uneven halves. There may only be a relatively few high-paying and high-rewarding jobs available for a few highly trained and highly skilled workers, but less fulfilling and lower paying jobs for the large majority of workers. In other words, high-technology does not necessarily translate into high pay or high interest work. The jobs of the past which produced the bulk of the American middle-class incomes are beginning to disappear as computers and robots flourish and take over the tasks formerly performed by skilled and unskilled production workers and by lower level management personnel.

Innovative private and public sector initiatives will be needed to address the troublesome social issues produced by the decreased opportunities to participate in economically and psychologically productive activities within employment settings. Such efforts will affect all of society, including the disabled population. Proposed solutions for these potential social and economic problems stimulated partially by increased use of high-technology in the emerging society have often revolved around providing economic incentives for workers for participation in psychologically rewarding and publicly needed community service activities through the establishment of sabbatical leaves and time-credits. Similar pay and compensatory time benefits will undoubtedly be provided many workers for further education and training which may prepare the individual for better employment.

In addition, Toffler (1980) suggests that there will be an increasing amount of productive time spent by individuals in "prosumption" activity which is directed toward the production of goods or services to be consumed by the prosumer. The growing and preparation of food, production of clothes and household goods (primarily through participation in computer aided design and manufacturing of the products), and the repair of home structures, furnishings, and appliances are all "prosumption" activities. These activities can significantly reduce the income requirements for the individual. In Toffler's view, workers will be financially able to select part-time rather than full-time employment in order to devote more effort and time to psychologically satisfying and personally useful prosumption activities. Thus, the challenge for the rehabilitation and training communities may be as strong to prepare disabled individuals for recreation and prosumption as it is for employment.

Another issue producing concern relates to the now common placement of disabled people in word-processing positions. The introduction of a number of computer access technologies including speech and braille output sensory aid devices has made word-processing a viable and popular employment option for many disabled, especially blind, people over the past five years. Three changes in the handling of data entry and editing activities within business and industry will alter this field for all workers thus severely affecting a newly identified employment area for disabled people. First, many advanced word-processors and text editing software packages use sophisticated visually oriented displays which have been designed to assist the sighted operator. These programs are inappropriate for either braille or speech presentations. Thus, blind people cannot be employed in these word-processing positions where use of these formatted screen displays is required. Some blind individuals have lost positions because employers upgraded word-processing equipment, and the new software was inaccessible to the blind employee.

A second event which has cost disabled people word-processing positions is related to the decentralization of work. Many businesses and institutions have begun to contract word-processing and other clerical tasks out to small firms. Although this practice has eliminated some jobs, the apparent irony has its positive side in that disabled people may find employment with the contracts or exercise the option of establishing their own firms and bidding on available contracts. This latter approach has the advantage of assuring that hardware and software used in the word-processing activities will

be appropriate for use with either speech or braille displays.

The establishment and operation of firms specializing in word-processing activities will be a common phenomenon in the nation's workplace for probably the next 20 years. At some time in the future, speech recognition equipment and computerized dictionaries, tied together, will provide executives and other white-collar workers with the capability of producing their own documents without the intervening step of data entry by clerical personnel. The demand for word-processing skills will gradually wane producing the final irony to the recent enthusiasm for preparing disabled people for careers in word-processing. Nevertheless, this point in time should be at least two decades away. Numerous employment opportunities in word-processing will continue to exist; and access technology, combined with appropriate software, will make the microcomputer an inexpensive word-processor for disabled workers..

The advances in software have not been limited to word-processing packages, and a problem similar to that mentioned above is frequently being encountered elsewhere. Newly developed software packages are commonly highly visual in orientation utilizing special screen formats, graphically presented material, and even dynamic displays. These latter are limited primarily to the popular and compelling educational and recreational programs. The impact upon blind people of this rapid advance in computer software has been the creation of an ever increasing gap between them and their sighted peers. Where equality existed very recently, inequality has returned and threatens to expand. A separate, but equally exasperating problem, arises from the desire of software developers to protect their work from unauthorized duplication. Special codes are commonly placed at the beginning of commercially available software disks which restrict users from sending the material to a peripheral device, which typically would be a printer, but for blind users, is a sensory aid device. Such "protected" software is normally inaccessible to the blind user. The final result of these several software limitations is the desperate need for many specialized software packages for blind users, for employment, education, and recreation.

Summary of the Implications of Disabled People of An Electronic Information Economy

The preceding discussion has contained a number of references to the impact associated with the use of computers -- especially microcomputers -- and

computer access technology upon physically disabled people in the changing economy. These changes are based upon the use of computer technology for the manipulation of electronically controlled information, a process which is performed competitively by disabled individuals using the appropriate technology, a summary of these observations is provided below.

(1) Computer and access technology can provide disabled individuals equal access to most of the electronic information available today and in the emerging information society. The personal microcomputer makes this access possible at a reasonable cost and virtually in any location.

(2) The increased use of computer technology in employment by "knowledge" workers who work primarily with electronic information is increasing employment opportunities for disabled individuals. To exploit this opportunity, it is essential that the most appropriate hardware and software for use by disabled people is developed and disseminated. People who cannot interact with computers will be at a severe disadvantage in the new economy.

(3) The new economy appears to reflect a changing social order in which individuality and diversity are accepted more than in the past. Societal attitudes towards physical disability should be more flexible than formerly. Disabled individuals should, like others in the society, be provided multiple options in the selection of life styles including employment.

(4) Specialization in employment is giving way to diversity of activity. This change could have negative consequences for many disabled workers who could not perform some of the additional assigned tasks. But this change is also accompanied by increased involvement of workers in the selection of tasks. Work, like products, is becoming increasingly customized to meet individual needs and desires. This democratization of the workplace can lead to improved accommodations for disabled workers.

(5) New industries are emerging as the backbone of the new economy. Career education to prepare disabled individuals for inclusion within these scientifically based industries is needed. Knowledge workers will predominate within these industries is needed. Knowledge workers will predominate within these industries with work tasks which will emphasize the creation and manipulation of electronic information. Appropriate preparation will increase employment opportunities for disabled individuals.

(6) The proliferation of computer aided manufacturing which will utilize speech output terminals to

signal problems and to give workers verbal instructions can provide many multi-handicapped individuals with relatively simple monitoring tasks in industry.

(7) The use of microcomputers and telecommunications systems will result in an accelerating number of industry and business personnel performing work tasks at home rather than in a central office. Most of these information jobs can be performed by disabled individuals using the appropriate technology.

(8) Small businesses, created to provide white-collar type services to other businesses, are rapidly expanding in number. These "electronic cottage" businesses provide disabled individuals with an increasingly significant employment potential, both as employees and as entrepreneurs.

(9) Education services are moving toward an emphasis upon the use of computer technology in alternative education structures including home study programs. Microcomputers and access technology can provide disabled individuals with equal access to most of these instructional programs. Appropriate software will be essential to take advantage of these expanding educational opportunities. Independent literature research is already becoming a reality through the proliferation of electronic data bases which are accessed remotely by the use of microcomputers.

The opportunities for increased equality for disabled people in the information society will depend upon an aggressive effort on the part of interested people. Without these efforts, many disabled individuals will not be able to avail themselves of the advantages and the exciting possibilities offered by the electronically controlled information resources. In fact, the gap between the able-bodied and physically disabled populations may expand. This latter situation is a possibility if an organized effort is not made to prepare the professional service delivery system, necessary training programs, the industrial and business communities, the physically disabled populations, and the appropriate instrumentation and software.

Concerted and sustained efforts, undertaken for the purpose of promoting improved quality of life for disabled people in the electronic information age, should be designed, organized, and implemented from within the professional service delivery system, for organized consumer groups. The areas of activity listed below are among those which should be included within the agenda of efforts to be undertaken.

1. Immediate efforts must be undertaken to familiarize rehabilitation professionals with the

possibilities and probabilities of the use of computer technology in the changing economy and society. These professionals must begin to recognize the realities of a changing world and become computer "literate" themselves so that they can better serve the needs of their clients in the years to come. This endeavor will require extensive in-service training activities conducted nationally.

2. Vocational training should emphasize instruction in the types of services in demand within the current marketplace. Today, these services in demand within the current market-place. Today, these services would include word-processing, accounting and filing, scheduling, data base establishment and operation, product and service marketing, and software development. Flexibility in curriculum would be essential, governed by projected market needs.

3. Vocational training programs must be designed and established for the purpose of preparing disabled individuals in the establishment and management of their own electronically based small businesses. These would include all of the common topics related to small business management activities including such things as marketing one's services, bookkeeping, tax management, and the ramifications and procedures for incorporation.

4. Efforts must be initiated to improve the training of physically disabled individuals in scientific disciplines. The growing industries of the future will be primarily in scientific areas -- electronics and computers, space, oceanographics, and biology. Advanced scientific training for disabled people cannot be limited to the first cluster. Guidance from the professionals directing these activities will be required so that appropriate instruments and techniques enabling inclusion of disabled students in educational and training programs can be developed. Realistic career education relating to these scientific disciplines can only be developed by those familiar with the various task requirements within these fields working with those fully familiar with the capabilities and limitations of people with physical restrictions. These efforts will require the cooperation of science curriculum specialists, rehabilitation and special education professionals, and industry representatives.

5. Activities must be undertaken to encourage industry to become involved in the design and testing and demonstration projects which investigate the most appropriate means to employ multi-handicapped people in computer assisted manufacturing processes. Appropriate tasks must be identified, the speech output signals and instructions designed, and the manual responses developed and tested.

Conclusion

The initiating of activities to promote and facilitate use of computer and access technology by disabled individuals in the performance of employment activities in the future can result in the highest level of equality attained by this population in history. Denying or ignoring the reality of the economic and social changes occurring in this country could severely restrict the realization of the possibilities inherent in the emerging information society. The extent of the efforts initiated in the immediate future will greatly determine the level of success achieved in harnessing the forces of change

and using their power to enhance the independence and productivity -- and thus the quality of life -- of disabled people. □

References

- Broder, David S. "A changing workforce." *The Washington Post*, August 31, 1983.
Deken, Joseph. *The Electronic Cottage*. New York: Morrow, 1981.
Jones, William H. "Simmons says Post Co. looking for opportunities." *The Washington Post*, February 21, 1982.
Naisbitt, John. *Megatrends*. New York: Warner Books, 1982.
Toffler, Alvin. *The Third Wave*. New York: Morrow, 1980.
ss4-pagel-bruyere

Excerpts of Reviews and Comments

The following are excerpts of reviews, comments and questions raised by the Switzer Scholars. These are presented to further stimulate thinking, discussion and action as it relates to the content of CHAPTER 3 by Lawrence A. Scadden.

The author touched upon an area that is, in my view, one of the most enormous benefits of the computer age, homebound education. Educational level is perhaps the major determinant of prosperity of an individual and of a nation. The ability to acquire knowledge is greatly facilitated by the computer and telecommunications technology. Computer technology is perhaps the single most important vehicle in providing education and training services to persons with disabilities. Homebound education may well be the wave of the future for academic pursuits given the advent of the new technologies. Homes may become the satellite campuses of the future.

Academic fields of study such as education, medicine, business administration, political science, economics, law and virtually any other field can be made available to persons with disabilities, who because of physical limitations are precluded from attending the traditional college campuses.

Computer program software coupled with the latest technology in video taping and telecommunications can be used to bring the classroom and instructor into the home. Persons with deafness could gain access to virtually any school by having a captioned or American Sign Language feature added to the program or video tape.

Given the advances in computer and telecommunications technology, persons with disabilities will gain access to universities and colleges where program and architectural accessibility is man-

dated by Federal law, but whose inaccessible campuses were constructed long before the promulgation of these Federal mandates. Institutions of higher education and other schools could project the classroom into the home of the person with a disability. The individuals would need to attend the campus only periodically, if at all. In fact, exams and term papers could be input from the home and graded by the instructor at the push of a button. The person with a disability could input certain instructions and receive a copy of his/her transcript or latest scores. The potential of computer technology in the educational arena is limited only by our imaginations.

--Ted M. Daniels

In any revolution there are many underlying causes that are often not clearly recognized or understood as contributing to the revolution until they are examined from an historical perspective. Dr. Scadden's paper describes some of the major underlying causes or contributing factors to the information revolution that we are now experiencing. We, therefore, do not have to wait for the passage of time to realize the importance of these influences.

Dr. Scadden gives us a concise description of what is happening and what we can expect. We are witnessing not just the development of a new "industry" but also a fundamental shift in our country's economy. As Dr. Scadden points out, the roots

of the changing employment picture preceded the emergence of the computer as a common industrial and business tool. They are buried in **economics** rather than **technology**. Computers became a means to facilitate change rather than to initiate it. There are now more white collar workers than blue collar workers. American industries are relying more heavily on less expensive foreign labor for numerous manufacturing tasks. As Dr. Scadden states, the 300-year old industrial age is near its end, but at the same time, disabled workers will be able to compete in the emerging employment sphere better than at any time in history.

We must understand this fundamental shift if rehabilitation and disabled persons are to benefit. There should be no excuse for rehabilitation professionals to be computer "illiterate". We are doing a grave injustice to clients who have one of the best opportunities in the history of rehabilitation to participate in the regular work force while receiving salaries comparable to nondisabled workers.

Most important was Dr. Scadden's reference to studies performed by a Hewlett-Packard plant and a pharmaceutical firm in Canada that produced estimates indicating that between 35% and 70% of the industries' work could be performed from home if the companies were willing to invest in the necessary telecommunications equipment. The implications for home-based employment of the most severely disabled is obvious.

Dr. Scadden discusses **four clusters** of industry as anticipated rapid growth in the coming decades, viz., the electronics and computer industry; the space industry; oceanographics; and the biological industries. These four industries will provide the backbone of the future economy. All these industries emphasize the role of knowledge workers. I would like to make the observation that while the electronics and computer industry is one of the four clusters, it will also be essential to the other three.

There are many other fine observations that Dr. Scadden brings to our attention. One of the best, I believe, is in his final comments: "The initiating of activities to promote and facilitate the use of computer and access technology by disabled individuals in the performance of employment activities in the future can result in the highest level of equality attained by this population in history. Denying or ignoring the reality of the economic and social changes occurring in this country could severely restrict the realization of the possibilities inherent in the emerging information society." We as rehabilitation professionals and consumers must ensure that these realities will not be ignored or denied and that disabled persons in our society will

be an integral part of these fundamental changes in our society.

--Robert J. Gilmore

Dr. Scadden reminds us that for 30 years we have been beyond the industrial age. The computer age followed and rapidly moved ahead by development of the computer "chip". He notes that "computers neither have prejudice nor preference." Equalization of opportunity through computer technology may be particularly true for those with sensory disabilities.

We need to encourage the necessary specific adaptations of the computer so that it can be used effectively by those with motor disabilities, learning disabilities, etc. Research must be conducted which would assure that the needs of various disabled groups are considered.

The decentralization of work and increase of work has many implications for rehabilitation. Training programs are needed to teach disabled individuals how to take advantage of these new options for competitive employment. Expert resources must be identified and tapped to provide on-going assistance to those who are "going it alone", i.e., as in a small business.

The entire rehabilitation community must respond **now** to assure that disabled persons have a part in the economic and social changes that are occurring as a result of the new information technology. Everyone involved should identify their part in the overall effort and begin to account, at least to themselves, for their contribution to the inclusion of disabled individuals in the information age.

--Donald C. Linkowski

Dr. Scadden's paper portrays the technological era and its future promises to the U.S. labor market very clearly. The technological resources will open employment opportunities for many cognitively inclined physically disabled persons in on-site and home-based jobs provided innovative techniques and appropriate training programs are developed for this population. To initiate home-based employment, one needs information on such variables as installation and maintenance of equipment, transporting work materials, psychological adjustment, zoning permission, security of work materials, babysitting, etc.

To tap this future employment potential, the rehabilitation practitioner, researchers, and employers, need to demonstrate practical training and placement models so that severely disabled per-

sons can join the competitive labor market and become taxpayers rather than tax recipients in our society. There also lies a bigger challenge for people who are cognitively limited such as persons with mental retardation, mental health problems, learning disabilities or organic brain damage. Many of these individuals may need close supervision and as such, traditionally home-based employment will not be feasible, especially for the jobs requiring reading, writing, and quick decision-making with little room for error. This will remain a greater challenge even for on-site jobs. Many sheltered workshops are traditionally geared to assembly and manufacturing related products. How will they respond to the future needs especially when rehabilitation dollars to these facilities are shrinking day-by-day?

Although it is late, there is still time for the funding organizations, researchers, rehabilitation practitioners, employers, lobbyists, consumers and politicians to develop innovative techniques so that people with any type of disability can optimize their potentials into the "computer age society."

--Kali Mallik

This is an excellent paper which outlines the employment and training opportunities which potentially exist for disabled persons utilizing computer technology. This area probably represents one of the most fertile applications of vocational rehabilitation since it allows severely disabled people to perform "think" rather than "do" type jobs. The paper does a good job of addressing the most important issues related to the interaction of the disabled person and this technology, however, there are some issues which could be given additional emphasis. They are:

1. A distinction should be made between the capabilities of the congenitally disabled person and individuals incurring disability through trauma. In many cases, the congenitally disabled person does not have the social/educational background to take advantage of the opportunities afforded by computer technology. The 20 to 30 year old congenitally disabled person has largely been educationally deprived and therefore does not have the sophistication that the post-trauma victim has since this individual would have typically experienced a normal/educational process. It might well be that the greatest contribution that the computer can make to the congenitally disabled person is in the areas of remedial education.
2. The cottage industry concept is an excellent one, particularly for the severely disabled person who

might need assistance in feeding, toileting, etc. One potential problem in the implementation of such a strategy, however, is the fact that most HUD (Department of Housing and Urban Development) leases contain provisions that an individual can not use his/her apartment as a place of employment. Since many persons with disabilities are poor and subsequently live in HUD-subsidized housing, this is an extremely important consideration. Leases will have to be modified to accommodate a home-bound type of industry. Additionally, persons living at home who need aide and attendant care not provided by parents, relatives, etc., must have some means of securing these services, such as Medicare, Home Health Care Agencies, etc., This is an important consideration which can contribute greatly to success in home-bound employment.

3. The severely disabled person will need some sort of technological interface between himself and the computer. The multiple disabled cerebral palsied individual, for instance, will probably access a keyboard through a head stick or mouth stick. Considerable research in the areas of keyboard design and computer accessibility will have to be conducted to insure that this individual can be productive relative to quantity and quality of work.
4. Many disabled persons, both physically and mentally disabled, work in sheltered workshops. The computer revolution, if it is to be successful, must also take place in sheltered work environments. If the ultimate goal of a sheltered workshop is mainstream placement, then introduction to computers and computer technology must be fostered in the sheltered work setting.
5. The special education classroom must be the source of initial training in computers and computer technology for the disabled child. At the present time, special education does not emphasize vocational objectives for the disabled student, particularly those who are severely disabled. Vocational objectives will have to be prepared for the disabled student as early as the secondary school level. The special education teacher will have to be schooled in the applications of computers for disabled students as well as the potential for employment in this areas. Career information relative to potential jobs will have to be disseminated to student and teacher alike.
6. The element of cost is always the deciding factor in determining potential productivity levels of disabled persons who need adaptive devices. The severely disabled person who can access computer technology through assistive devices will

have to be provided those devices at minimum cost or no cost if he/she is to be productively employed. A service delivery system providing training, hardware and, possibly the computer itself, will have to be developed either by federal and/or state agencies, or potential employers, or all three working in concert.

The computer will certainly be a factor in allowing the disabled person to achieve a normal lifestyle, particularly in the vocational realm. It should be realized, however, that for the severely disabled person, **the computer is no panacea**. Specialized adaptations and research into the brain damaged person's ability to process information is absolutely necessary to insure success in this emerging field.

--John H. Leslie

Dr. Scadden presents an outstanding assessment of the information age and its employment opportunities for persons with disabilities. His predictions and observations should be required reading for anyone in business, industry or rehabilitation, who has responsibility for placement or advancement of persons with disabilities.

It is very clear from Scadden's paper that the information age will provide a wide array of employment options from which an individual can choose. The impact of this has the potential to significantly increase the number of persons with disabilities in the work force. However, business, industry and rehabilitation personnel must work to insure that options remain just that, **options**, and do not become new stereotypes for persons with disabilities.

It is also apparent, from Scadden's predictions, that job opportunities will undergo a rapid and continuing change. Existing jobs will phase out or be significantly restructured, and new jobs will be created. The concept of employment in a single career using an individual's lifetime is diminishing. The complications for rehabilitation are significant. Rehabilitation professionals must become more familiar with the world of business if they are to accurately forecast future job opportunities and develop required training programs. As job opportunities change, rehabilitation professionals must be prepared and willing to assist business and industry with lateral and upward mobility options for employees with disabilities. This may include providing retraining for persons with disabilities who are currently employed.

Businesses and industries that conduct in-house training programs must insure that such programs are accessible to employees with disabilities. More than just making physical facilities accessible, train-

ing programs must be adapted and instructors must be prepared to train employees with disabilities especially those with impairments affecting communication.

--Jay Rochlin

With respect to Dr. Scadden's description of the "electronic cottage", I am a believer in the principle that the design of any worksite is intended for the convenience and economy of the permanent inhabitants of the site. Thus, hospitals and schools are designed for the convenience of the respective staffs, and not the patients or students; similarly, factories are designed to maximize the convenience of owners and managers, not so much the workers. Therefore, if business or industry is asked to consider to an extensive degree "electronic cottages" outlying worker locations, it will respond with the usual query: "How much more (or less) will it cost in the long run?" I have no idea what the projected costs and savings might be.

I perceive both optimism for the future of the disabled and a warning of an increasing gap in the quality of life between disabled and able-bodied populations. The effect is understandable, and can be offset by more intense efforts of the rehabilitation agencies, but are they really prepared for the additional demand?

In light of the Federal government's interest in distributing responsibilities to the states or to the private sector, what are the chances for the restructuring of the technology of service delivery. In other words, with less money now available to run the office, it might seem a little foolish to spend it on redecorating. This may be the way some workers will view the high-tech applications they must learn.

--Carl E. Sherrick

The paper by Larry Scadden effectively highlights new, exciting challenges and opportunities for the disabled in the electronic or computer era.

Scadden points out this new period which follows the agricultural and industrial revolutions, is ripe with rich opportunities for "qualified" disabled persons to enter into the mainstream of the marketplace. This remarkable change has been made possible by the nature of the new technology which maximizes "intellectual capability" and minimizes physical, motoric factors. In effect, electronic intervention "neutralizes" disability and enhances accommodation. This new environment whether it be in the home or the workplace can be "normalized."

Scadden speaks of the significant impact this new

"information age " will have upon the social, economic, and cultural makeup of society. Added to this will be a political explosion as "politicians and statesmen" struggle to meet the new demands of society in their broadest form. Business, industry and labor unions all will need to "regear" their structures and functions to accommodate to the fast-changing requirement of the marketplace. Consumer and workers will equally have to shift in their thinking and set new priorities.

Training in all forms will experience the greatest shock. The schools and colleges as well as technical institutes will need to revise and restructure. Teachers and specialists of all kinds will need to be retrained or certainly at the least be upgraded. The "computer age" will dictate the type and quality of training as the "instruments of technology " with their precision, speed, and accuracy will require no less.

In the field of rehabilitation, these same requirements and standards will be posed. Traditional ways of doing things will have to be replaced by technical and scientific foundations. The humanities will still serve as a basis, but will require more depth and precision. Methodologies will need review and modernization.

Professional training and curriculum restructuring will need to undergo drastic changes. In fact, the entire professional preparation curriculum will need "major surgery" and refocusing.

Despite all these changes, a most promising development is that disabled people will be judged more on the basis of their abilities. Prejudice should be reduced as disabled people demonstrate their abilities and prove their worth in the marketplace. Equality of opportunity will become the "norm."

The challenge of the **computer age** is here but the question is **are we ready to accept it?** History is not on our side because in the past, the specialist has not always been prone to change or accept that which is new.

There is a clear choice, unless we change and prepare to accept the new challenges and opportunities, we will surely be replaced by those bright enough to move ahead and recognize the realities of the "computer age," and its benefits.

--Angela Traiforos

I am in full agreement with the points made by Dr. Scadden in this paper. Although he does stress computer operations and programming as major areas of potential for disabled persons, he also recognizes that computers and micro-processors will make possible productive and competitive work in industrial and business environments that are not

wholly in the information field.

Dr. Scadden's presentation recognizes quite appropriately that computers and microprocessors not only provide access to information, but also have been used extensively as electronic control systems for actuating assistive devices and systems which perform functions needed by disabled persons.

The reviewer compliments Dr. Scadden on the precise nature of his paper which illustrates the major potentials of disabled persons in the "computer age."

--Joseph E. Traub

Summary of Recommendations

The following is a summary of the recommendations and implications for action developed by the Switzer Scholars as they relate to the topic of the third chapter. (The recorder was Valerie Ellien).

1. Recommendations and implications that would enhance service delivery:

Computerized approaches to obtaining labor market information and job matching should be implemented in the rehabilitation service delivery system as soon as possible.

2. Recommendations and implications for policy or program development:

Design, planning and implementation of research, training and service delivery programs must include representatives of business, labor, consumers, rehabilitation and experts in technology. Strategy: NIHR, RSA, Certification bodies should acknowledge the importance of this representation.

3. Recommendations and implications for policy or program development:

A. Training for service providers in technical applications (aids and accommodations) should emphasize low cost, low technical solutions whenever possible.

B. Information on the new technologies must be disseminated in a timely manner and training in this area should become a priority in all university-based in-service as well as pre-service courses in Rehabilitation Counseling.

4. Recommendations and implications for needed research:

A. Research is needed to identify appropriate means of matching individual preferences, skills and abilities for new job opportunities in a decentralized work economy. Research should include techniques of individual assessment; job task-analysis and supervision.

B. Rapid technology and change will exacerbate currently inadequate labor market information needed for career planning and training strategy: Ongoing research is needed to identify the nature of future job tasks and required skills. This information needs to be disseminated quickly to the practitioner for use with clients.

C. Research involving both business and rehabilitation is required to explore the appropriate employment roles for multi-disabled and mentally retarded individuals in the information age. Results of this research should be transferred at the earliest possible time to sheltered employment facilities for implementation.

5. Recommendations and implications for legislation -- Federal, State, local:

A. There is a need to extend to all employers the responsibility for disabled person. Strategies: Legislation should be designed to modify Title VII of Civil Rights Act to include persons with disabilities. Tax laws should be modified to provide realistic incentives for removal of architectural barriers and acquiring technical accommodations.

B. Legislation should be designed to enhance maximum career flexibility rather than a one-time placement. This includes expanded **post-employment services** acknowledging mutual responsibility of business, industry, labor and rehabilitation.



Switzer
Scholar
Bruyere

Chapter Four

Impact of High Technology on the Rehabilitation Professional: Changing Roles and Skills

By Susanne M. Bruyere

Introduction

The bleakest reality we must face in this Institute is that the demand for Vocational Rehabilitation service has grown and is growing at a rate almost incredibly greater than our demonstrated ability to provide such services... Should we not feel a sense of urgency then in seeking to identify and eliminate unnecessary delays in the process of referrals and applications? Should we not challenge tradition and customs, challenge pre-conceived opinions and assumptions as we seek and study alternatives to our present processing methods? I believe we not only should but must. The future identity of Vocational Rehabilitation as a service entity could depend upon it. —

Al Slicer's words ring even more true today than they did 20 years ago. The challenge is greater now than ever to meet the vocational rehabilitation service needs of individuals with handicaps to employment, in the face of a nationally depressed economy, drastic cutbacks in federal and state monies, and the current political climate.

The purpose of this paper is to explore how some of the tools of the new high technology revolution may assist us to meet this challenge. Computers, satellite, cable television, and teleconferencing are increasingly being used in the business world as a means to facilitate data transfer, conduct meetings,

present training and disseminate information, deliver services, and promote products. It is the assumption of this author that a move toward the integration of this technology into all phases of VR operations, such as agency administration, client service deliver, and rehabilitation research and training has already begun. And, that this Eighth Switzer Memorial Seminar has been devoted to this topic because leaders in the field of Vocational Rehabilitation, seeing this trend as both desirable and much needed want to identify ways in which we can facilitate this movement toward effective use of the new technologies to further our purposes.

Much has been written in business education, and the human services literature about the impact of the "information age" and the "technology revolution." Too often this literature reflects a preoccupation with the technology systems, rather than the people impacted by the systems. Although both organizational and technological systems are powerful facilitators for the delivery of services, they still must depend upon human deliverers for their effectiveness. The best of systems, "high tech" or otherwise, will not enhance delivery of services if deliverers are biased, uninformed, fearful, apathetic or inefficient in its use. This paper seeks to explore the **importance** and the **impact** of technology on the role and function of the deliverer of vocational rehabilitation services -- the counselor.

Specifically, this paper:

1. Validates and provides examples of current and projected uses of technology for a variety of applications within rehabilitation.
2. Discusses the impact of the technological revolution on the role and function of the rehabilitation counselor in the provision of services to individuals with disabilities.
3. Discusses the implication of these changes for rehabilitation education, training and research, in attempting to assist the counselor to successfully adapt to the changes high technology is bringing to their functioning.
4. Explores ways in which the agency in which the counselor works can provide an environment that heightens the likelihood of a smooth and successful integration of innovation and adoption of change.
5. Offers some suggestions to rehabilitation agency administrators and federal policy makers on ways to encourage effective movement toward knowledge and use of the new technologies.

Implications for the VR Counselor

At the core of the success of the adoption of any innovation is the intent and receptivity of the potential user of the innovation. Key to the successful integration of technology into the delivery of vocational rehabilitation services, then, is the counselor. This section of the paper will provide some discussion of the role and function of the rehabilitation counselor both historically and futuristically, with an emphasis on the new skills and information that counselors will need to function effectively in a high tech environment.

The Changing Role and Function of the VR Counselor

"Ideally, the disabled client should receive the services needed when he needs them in the appropriate amount, order and quality."² Few of us, I believe, would quarrel with this statement by Jim Burrell, then Acting Commissioner of the Rehabilitation Services Administration. Yet, at-

¹ Slicer, A. *Training methods in Vocational Rehabilitation. Fourth Institute on Rehabilitation Services. Washington, D.C.: U.S. Department of Health, Education and Welfare, 1963.*

² Department of Health, Education, and Welfare. *Selected Approaches to Expedite the Delivery of Vocational Rehabilitation Service. Ninth Institute on Rehabilitation Services. May 10-12, 1971, p.iii.*

tempting to achieve this ideal has increasingly placed counselors in conflict as their own and the agency's differing expectations of their performance become evident. Counselors, viewing themselves as professional service providers, tend to most highly value their client counseling interaction, their creativity, and autonomy and freedom of action in their work. Yet, as agency resources (time, money, and man-power) become even more scarce, counselors are asked to spend more time in accountability and documentation tasks, which coupled with increasing caseloads and diminishing personnel, limit their ability to exercise those professional functions which they most highly value.

It is the premise of this author that the technological revolution is none too soon, and, if judiciously introduced to and implemented in VR agency functioning, may prove the tool to stem the tide of proliferating paperwork, and save the sanity of many a rapidly burning out rehabilitation professional.

To make this point, let us examine some of the major areas of change which are now impacting VR counselor functioning and explore some of the ways in which technology is both bringing about these changes and creating these stressors, but also how the new technologies may be able to contribute to agency and counselor functioning by offering alternative ways to meet growing work demands. The five areas of change which significantly impact a counselor's job are taken from the Seventh Institute on Rehabilitation Issues, **Strategies and Options for Change: A Guideline for Counselors**. They are consumerism, accountability, technology, decreasing resources/increasing competition, and organizational functioning (National Institute on Handicapped Research, 1980).

Consumerism and Accountability

The increased involvement and self advocacy of individuals with disabilities in the early 1970's led to significant rehabilitation legislation designed to assure heightened accountability in the provision of VR services and involvement of the client in all phases of rehabilitation. However, as a result of the Individualized Written Rehabilitation Program and other documentation requirements, the VR counselor devotes considerably more time to paperwork prior to providing services to the client. Laws regarding confidentiality have made counselors more cautious and concrete in their narrative recordings and other pertinent documentation. Obtaining prompt and pertinent medical and psychological records from other agencies, likewise, has become

more difficult because of their confidentiality regulations (National Institute on Handicapped Research, 1980, p.6).

Simultaneously, the rapid growth of VR services in the 1960's encouraged the addition of more agency controls to insure counselors are complying with federal law and regulation. These two major trends have led to increased accountability and often subsequent paperwork for the VR counselor, diminishing the time counselors can spend in direct client contact. To try to relieve the professional of some of the burdensome aspects of record keeping many agencies have already moved to computerized case files. Though now still in the infant stages of implementation when viewed as a national trend, computerization promises the potential to free professionals once again for more time for client interaction.

Technology and Knowledge

The knowledge explosion and rapidly expanding technology provide exciting possibilities to improve the quality of life and functioning of disabled individuals. However, keeping up with the multiplicity of new ideas and products, locating their availability and sometimes, meeting their costs, present a challenge to the rehabilitation counselor (National Institute on Handicapped Research, 1980, p.9).

As the Ninth Institute on Rehabilitation Issues points out while the technological advances in micronics, computer science and human engineering offer new vistas for VR clients and their counselors, they also mean that the agency must provide educational opportunities and technical resources for the counselor. This need occurs at a time when training funds have been severely reduced, limiting the numbers of programs and the numbers of participants. However, the use of technology, i.e. telecommunications, in training and continuing education could be a solution, and is being used in some training efforts (Bruyere, 1982; West Virginia Research and Training Center, 1982).

Decreasing Resources/Increasing Competition

Other private and public agencies have become involved in serving the disabled population. Rehabilitation programs operated by insurance companies are becoming more and more common. Another rapidly growing service is provided by private rehabilitation counselors. With decreasing public sector funds, many VR agencies are becoming more aggressive in the use of third party fun-

ding and coordinating purchase of service agreements. To be competitive in the provision of timely, high quality VR services, public sector agencies will need to be willing to take risks to invest up-front resources in innovative procedures and techniques which can have long-range payoffs in personnel productivity. Computerization of administrative record keeping, career exploration, and job development information is currently being used in many settings and can greatly facilitate case turn around time (Arbeiter, 1981; Bonifacio and Nolan, 1978; Bruce, Varelas and Shuman, 1982; Jarvis, 1978; and Rayman, 1981).

Organizational change

Changing federal legislation and priorities and politicization in state bureaucracy resulting in shifts in agency program and policy means that agency administration and staff are asked to continuously respond to changes imposed from outside the agency. Often, too, cutbacks in funds has resulted in consolidation of social agencies with program functions, funding and personnel being thrown into a common hopper creating turmoil for personnel and clients alike.

One of the ways to counteract the potentially disruptive, if not, destructive aspects of these organizational changes is enhanced internal agency communication. Many agencies are looking to telecommunications technology, such as the use of audio teleconferencing to tie together personnel who are geographically dispersed (Pease, Threlkeld, & MacNair, 1982). The increased communication and information dissemination within the agency which telecommunications technologies can make possible in a timely and cost effective manner heightens the likelihood that personnel at all levels can be involved in changes as they occur.

New Counselor Skills and Functions

The technological revolution demands that counselors will need to begin to prepare themselves with new information and to function in ways in which they perhaps have not functioned in the past.

Need to Become "Computer Literate"

Counselors will need to learn how to use computers for application to tasks which now may be done by hand by themselves or the secretary. In the future, professional competency expectations may well also include the counselor's ability to: file and access client case records by computer, build a computerized career exploration approaches, and locate

school and training opportunities as well as job openings by computer.

Knowledge of High Tech Labor Market

Automation involves the use of electronic devices to reduce the amount of work performed by people. Automation can:

- *Reduce the number of people required to perform the same tasks causing displacement of people;*
- *Change the nature of tasks performed by people who retain their position; and/or*
- *Create new occupations and increase the number of jobs in existing occupations and increase the number of jobs in existing occupations in the same or other industries.*

While some sociologists studying the impact of the electronic information technologies suggest that the effect will be to "deskill" labor by lowering the skill requirements for workers, more anticipate that a greater premium will be placed on literacy, particularly technological and information literacy. The latter argue that an increasing number of jobs will be in the information sector or will require the rise of information systems. An advanced information society will place a premium on skills oriented toward the creation of new knowledge and the design of new technologies (Office of Technology Assessment, 1982).

It has always been important that VR counselors be apprised of labor market information, so that they might counsel clients into appropriate careers. With the shift to an information and technology-based economy, it is becoming imperative that information on technological trends and how these are effecting certain industries, become a part of the information base of every VR agency functioning.

As regards future labor trends, counselors will need to know:

- *What kinds of jobs are no longer available because of recent technological advances?*
- *What kinds of skills are no longer needed or useful?*
- *What kind of new jobs are emerging as a result of new technologies?*
- *Which new skills are needed?*
- *How can these skills be acquired?*

To successfully counsel toward occupations where the technology will be used, counselors themselves cannot be naive or fearful of the technology. Even better will be if clients see validation of the utility and practicability of such technology by its use in the delivery of their own VR services.

Expansion of Employer Services

The technological revolution could be used by VR agencies and counselors as a way to expand the services which they can offer an employer, thereby enhancing rapport with an employer and preparing the way for future placements. Projects With Industries and other organized placement efforts could use technological changeovers as a place where they can come in and assist industries to smooth the transition, providing consultation on the man-machine interface, as well as a pool of qualified workers prepared to deal with the new technologies.

Ethical Considerations

The vocational rehabilitation counselor, to provide his client with up-to-date information on career choices based on current labor market trends, the newest assistive devices and available job openings, will have a responsibility to become "computer literate." It will soon be impossible if it is not already, to stay abreast of changes in the areas mentioned without the counselor's use of a computerized repository and retrieval system.

Another area for consideration where counselor ethics is concerned, is the appropriate use of these new tools. Technological counseling aids, such as video tapes and computer print-outs, do not lessen but heighten the counselor responsibility to inform the client of the process which he is going through. As Sampson and Pyle (1983) point out, inadequate preparation of a client for a computerized testing experience can lead to invalid test results. Problems can also result when a follow-up of the client's use of a computer application is not provided. For example, potential misunderstandings and misconceptions may not be corrected. Also, potential inappropriate use of computer application may not be identified. Finally, the client's subsequent needs may not be examined. The lack of an appropriate follow-up may limit the beneficial results of using a computer application.

Thus, though the new technologies can provide a means to access a wider range of career exploration, labor market, and functional assessment data more expeditiously, counselors must be trained to use them in a way that will lessen the likelihood of the problems and pitfalls which can be a part of a technology application. The remainder of this paper outlines the ways in which both the agency and rehabilitation education and training can each play a part in assuring that a move toward increasing technological use in VR functioning is a successful one.

Role of Professional Education and Training

Technology in Higher Education

Many universities across the country have begun to use telecommunications technology to enhance the educational experience of their students. Administrative functions such as student registration, grades, and class scheduling, can now be much more expeditiously carried out with the use of computers. But this has been only the beginnings of innovation on American campuses. Educational institutions are beginning to recognize that if individuals are to thrive economically and socially in a world that will be shaped, to a large degree, by technological developments, that they must through education and training be assisted in adapting to this coming cultural revolution. Educational leaders of vision are garnering the resources and taking the risks to put in place new technological systems and new instructional curriculums to begin to provide students in higher education with the experiences that will prepare them for the coming information age.

Those in Vocational Rehabilitation are no less impacted by the technology revolution. As discussed in the section on the projected changing role and function of the rehabilitation counselor, VR service providers will soon need to be familiar with computer use to be able to access up-to-date labor market information, store and retrieve case material, as well as use selected diagnostic information. Preparation for both the skills and the attitudinal adjustments needed to successfully survive the coming new role and functions of the VR counselor must begin in rehabilitation counselor training in higher education.

Orienting VR counseling students to the new technologies need not mean massive make overs of existing rehabilitation counselor education core curriculums. Students can be made aware of applications of computers to vocational rehabilitation by the integration of these applications into existing courses. For example, classes on vocational diagnosis can include a discussion, or better yet a demonstration, of computerized diagnostic techniques. A course on Labor Market Information might have been built into it a class project whereby students are encouraged to examine the impact which the new electronic technologies are having on labor trends. Field placements in both public sector agencies and private businesses can be selected so that students get exposure to increasingly automated office settings and the high technology trends in industry. Students interested in more in

depth information of computers can be encouraged to take electives from the computer classes offered on campus.

Equally important to integrating information about the technologies in rehabilitation counselor education (RCE) curriculums, is the application of these technologies for actual instructional uses. For students to begin to become comfortable with the technology and to make an attitudinal shift away from the ideas that it is "cold and impersonal" and will not mix with counseling, they must experience the technology and see for themselves its potential usefulness. This can only occur if rehabilitation counselor educators begin to use the technology themselves to enhance their instructional approaches.

Applications of Telecommunications Technology To Education and Training

Various attempts have already been made within the field of Vocational Rehabilitation to use various telecommunications technologies to deliver training (Bruyere, 1982; West Virginia Research and Training Center, 1982). These efforts, however, are but a beginning in tapping the potential of the technology to assist us in the provisions of timely quality training to rehabilitation students and line practitioners. Communications technology can provide major improvements in the delivery of education and training in a wide variety of ways:

- **Computerized bibliographic searches** enable faculty and students to expeditiously review the literature on selected areas, using the most current publications for instructional and clinical reference.
- **In-service training for VR professionals** can be conducted by audio conference or distributed by current satellite technology. This will be particularly useful in rural areas where travel to training programs is expensive, both in terms of time lost from work and travel expenses.
- **Broadcasting VR conferences and training sessions**, as discussed by DeWitt and Katz (1977), can provide an alternative to the travel to these meetings, now severely curtailed by funding cutbacks and restrictions on out-of-state travel.
- **Access to national and international experts**, for either clinical consultation or instructional presentations can be gained by audio-conference or satellite (Bruyere, 1981). Nathanson (1978) proposed an expanded version of this application -- a worldwide special education television network which could provide relatively easy access to new research

developments and ideas, allowing different areas of the globe to exchange information quickly and accurately.

An added benefit of beginning to use a telecommunications technology approach to the delivery of education and training can be that through heightened cooperation in training efforts, there will be less duplication of efforts and our diminishing training resources can be used to deliver more training programs to greater numbers of trainees.

A study conducted by Katz and Elliott in 1979 on training needs of VR personnel pointed to the need for increased communication among training resources such as rehabilitation counselor education programs, regional rehabilitation continuing education programs (RRCEPs), research and training centers (RTCs), rehabilitation engineering centers (RECs), and agency in-service training. They concluded that there was a tremendous range of training programs being offered; often many different training programs being prepared to accomplish similar objectives. They recommended that it would be both feasible and cost effective to seek more standardization in rehabilitation training, and suggested that telecommunication technology has the potential to be cost effective in VR staff training delivery.

The Role of the Rehabilitation Educator

To assure that the technology revolution which the field of rehabilitation is beginning to experience is guided by the principles and values of our discipline, it is imperative that those in rehabilitation education take a pro-active stance in learning more about the technology and its implications for counseling. Loughary (1977) urges those in the counseling profession to examine what it is we want to accomplish and from this perspective assess the extent to which relevant knowledge is being used in the procedure being employed. Too often, because something is "of a computer," it is assumed without question to be valid. Computer software will always be only as useful as the amount of input the developer obtained from those in rehabilitation or counseling with the appropriate expertise to clearly define the needed end product's purpose. Too, the best designed software may be abused in its application if users are not adequately trained to understand both its potential and its limitations.

The technology era will bring with it many new concerns for the ethical considerations of counseling practice. As Sampson and Pyle (1983) point out, the current Ethical Standards (American Person-

nel and Guidance Association, 1981) do not specifically address the ethical issues relating to the growing use of computer applications in counseling testing and guidance. It will therefore be even more imperative that rehabilitation counselor educators assume responsibility for raising the awareness of students about possible concerns which may arise through the use of computerized assessment approaches.

In order to assist students, educators themselves must become more comfortable with and knowledgeable about the new technologies. RCE faculty must themselves take classes and attend seminars on the use of computers and the use of instructional technologies so they will be able to integrate these into both their curriculum content and their teaching approaches. Leaders at the federal level will heighten the likelihood that rehabilitation counselor education programs will begin to prepare students for the technology age by structuring incentives for programs to do so. For example, the Rehabilitation Services Administration (RSA) might request that applications for training funds reflect how RCE programs are moving toward the use of the technology both in the content of the core curriculums for RCE students and in the instructional delivery systems which they employ. RCE faculty can be further encouraged to move in these new directions by being able to get further training themselves either through national RSA or NIHR sponsored workshops or stipends which might be made available either for their own study or release time to develop new curriculums.

The Role of RRCEP's and RTC's

Staff of regional rehabilitation continuing education programs (RRCEP's) and rehabilitation research and training centers (RTC's) should likewise become resources for those in the field to find out more about the technology and its possible applications. RTC staff could be expanded or reconstituted to include individuals who have the expertise to provide consultation on the development or selection of appropriate computer software, procurement of telecommunications hardware or the production of other software such as videotapes. A central information center should be created whereby rehabilitation administrators and educators could secure current information and be made aware of previous telecommunications applications, existing software and the names of consultants who would be geographically accessible to them. Dordick, Goldman and Hannelman (1978) recommended that such a "Telecommunications Clearinghouse" be created in Washington, D.C.

RRCEPs, RTCs and rehabilitation engineering centers (RECs) themselves must employ the technology in order to be able to provide their constituency up-to-date information in a timely manner. As previously mentioned, audio-conferencing and satellite distributed training have already been used as training delivery mechanisms by RRCEPs and RTCs. Another technology which has been explored has been computer conferencing. Bruyere and Vandergoot (1982) describe an application of computer conferencing where seven rehabilitation researchers and educators spread throughout the U.S. worked together on a placement project using this electronic communication network.

Research and educational leaders in rehabilitation should also be the initiators of exploration of new approaches in the use of electronic technology to deliver training, provide client services, or promote public awareness. An example might be the use of free public access cable television production studios and channel access air time. RRCEPs could begin to provide training and technical assistance to agencies and advocacy groups on a wide variety of topics, such as how to access local media for public relations efforts, or how to deal with the human engineering problems which surface when an organization begins to computerize its administrative and service delivery functions.

Implications for VR Agency Administration

The Importance of Joint Planning

"Telecommunications," as used throughout this paper, means interpersonal communication by means of an electric or electronic system transmitted over wires or fiberoptic filaments or through the air via electromagnetic waves, or beams of light (Park, 1978). The stress is really on **interpersonal communication**, which too often we forget about in the glitter of our initial attempts to use the new technologies. The purpose of this section of the paper will be to explore the role which the VR agency can play in successfully bringing vocational rehabilitation services into the delivery mode of the technology age.

The aforementioned emphasis on interpersonal communication is significant because the simplest, easiest to resolve problems in telecommunication systems are the technological ones. People problems are the difficult ones. Park (1978) discusses why this might be true:

Small wonder it is often difficult initially to encourage people to use the new telecommunication environments, especially professionals, whose use

of language is what defines them and their activities to non-professionals as well as to themselves and their colleagues. It is asking a great deal of people that, for the performance of activities crucial to their existence, they abandon the security of the environment to which those activities are natural and, instead, use environments which they have every right to suspect are not only difficult but also lacking in capacity to permit the projection and reception of communication with the clarity, range, and shadings of meaning that face-to-face environments make possible (p.9).

It isn't possible to plan the use of the electronic technology until the people to be involved have some experience in the concept of the technology as an alternative means for the transmission of human interaction. Until people can conceive how they can carry on communication in environments mediated by telecommunications technology, they cannot plan the use of the new approach; and, they cannot conceive how to carry on such communication until they have had experience in its use.

Park (1978) stated that experience with telecommunication systems has indicated that "people will use the system only if they **want to**, only if the technology allows them to communicate in ways they perceive as normal, and only if they feel comfortable with the equipment rather than dominated by it" (p. 12). People will use the technology if it becomes evident to them that the experience will provide personal satisfaction or gain. Thus, counselors could be convinced in the use of a computerized case record system if they can see how it might help to lessen their paperwork load; educators and trainers might be willing to try a teleconferenced training approach if they determine that many more programs can be provided this way; and, individuals with disabilities might be willing to go to talk back television sites located across a state if they believe that their input will be used by VR agency service providers in planning (Department of Human Services, Oklahoma Rehabilitative and Visual Services Division, 1980).

A key to the success of the integration of technology is the involvement of the potential users in the planning process (Eason, 1982; Kimberly and Evaniski, 1981; Margulis and Colflesh, 1982; and Park, 1978). Park suggests that a planning group on the use of telecommunications technology for rehabilitation services delivery in a particular geographic locale might include VR agency administrators and planners, counselors, supervisors, some technology experts, VR clients, and representatives of other organizations with mandated in-

terests in the welfare of persons with disabilities such as school teachers working with students with disabilities, physical rehabilitation professionals, agencies concerned with deafness, blindness and mental retardation. To bring the energies of such a wide cross section of individuals to focus, Park suggest that less resistance to the innovation is encountered when the technology application proposed is designed to relieve a set of human needs made crucial because they are extremely difficult or impossible to meet, and which the majority agree is most in need of solution. This planning process should also build in a strategy to assure that both planner and user commitment can be sustained beyond the first phrases of the introduction of the new approach.

Maximizing Resource Use

Efforts have already been expended in the field of rehabilitation to identify possible applications and systems appropriate for VR's unique needs. Eldridge (1972) reviewed telecommunication technology particularly appropriate for improved administration and delivery of social and rehabilitation services and provide an outline of types of services possible and cost estimates at that time. O'Neill (1976) developed a procedural guide which describes how state vocational rehabilitation agencies can identify and access existing telecommunications systems and highlights the potential of these systems as tools for service delivery and administration.

Resources and models are therefore available for VR agency administrators and planners to begin to explore possible applications of the new technologies to the functioning of their own organization. As the experiences of past efforts suggest, projects designed to integrate telecommunications technology must not be done in isolation of existing approaches and concerns, but rather should be planned as an alternative or a way to augment efforts to alleviate an existing problem (DeWitt and Katz, 1977). The technology chosen, in addition, should make use of and "take off" from existing agency hardware and use existing staff expertise (e.g. computer systems personnel).

Exploration of the adoption of the new electronic technologies in any phase of an agency's functioning must include an all-out effort both to identify existing resources and systems, and the initiation of dialogue on possible user-sharing networks. Such collaborative efforts will lessen the likelihood of duplication of services and systems, and mean that more resource might be available for the procure-

ment of hardware and the development of high quality software. For example, a group of both public and private sector agencies might share costs on the development of public relations or advertising spots on radio or television. The benefits of such efforts can have far reaching effects for all service providers. The President's Committee on Employment of the Handicapped (1979) describes a comprehensive approach for producing a public relations program for disabled adults, but notes that because the promotion of a public relations program requires competitive service advertising it is important to get a broadly based community agency support system to make such a program possible. Haefner (1976) discusses the possible benefits of television advertising in influencing employers to hire or train disadvantaged persons. Such advertising could be of benefit to all agencies both public and private who are working in job placement of individuals with disabilities.

Summary

The purpose of this paper has been to explore the impact of the coming high tech revolution on the role and function of the vocational rehabilitation counselor. This author has attempted to not only provide some perspectives on how counselor functioning may be directly impacted by technological change overs, but how both rehabilitation educators and VR agency administrators have a significant role to play, to assist in making this transition a smooth and successful one. Acknowledging that such changes are foreign to our usual ways of working and communicating, pointing out how the innovation will directly benefit both the client and the counselor and involving the line practitioner in the planning process, will go a long way in helping to ease anxieties about such new approaches. Hopefully by taking such care, we all can enter the information age with a sense of enthusiasm and optimism for the potential benefits which these creations have for all mankind by making communication between people of all colors, cultures, creeds, disabled or not, truly possible.



References

- Arbeiter, S. (1981). Current and future delivery systems for adult career guidance. *New Directions for Continuing Education*, 10, 77-83.
- Bonifacio, P., & Nolan, J. (1978). Computer augmented counseling: Maintaining student services on a limited budget. *Journal of College Student Personnel*, 19(5), 398-401.
- Bruce, R., Varelas, E., & Shuman, R. (1982). Technology in career planning and placement. *Journal of College Placement*, 42(4), 35-38.
- Bruyere, S.M. (1981). Telecommunications technology to enhance rehabilitation efforts across cultures. *Rehabilitation World*, 6(3), 2-7.
- Bruyere, S.M. (1982). Use of telecommunications technology in the training of rehabilitation personnel.
- Bruyere, S.M., & Vandergoot, D. (1982). Electronic communication in rehabilitation: The future is now. *Journal of Rehabilitation*, 48(4), 49-53.
- DeWitt, J., & Katz, R. (1977). *Organizing to use a new telecommunications technology: Communications Satellites and Vocational Rehabilitation*. Final Report. Denver, CO: University of Denver, Denver Research Institute.
- Dordick, H.S., Goldman, R.J., & Hanneman, G.J. (1978). *Telecommunications and Vocational Rehabilitation: Barriers to Utilization by State VR agencies*. Report of RSA Grant #22-59035-001. Los Angeles: University of Southern California Center for Communications Policy Research, Annenberg School of Communications.
- Eason, K. (1982). The process of introducing information technology. *Behavior and Information Technology*, 1(2), 197-213.
- Elridge, F.R. (1972). *Telecommunications Systems for Social and Rehabilitation Services*. McLean, VA: Mitre.
- Haefner, J.E. (1976). Can TV advertising influence employers to hire or train disadvantaged persons? Campaign using prime time spots achieves higher recall and comprehensive rates than is usual for informational campaigns. *Journalism*, 53, 211-215.
- Jarvin, P. (1978). CHOICES: The system and its applicability to school counseling. *School Guidance Worker*, 33(3), 5-11.
- Katz, R. & Elliott, L. (1979). *Staff training via telecommunications: Analysis of needs and delivery alternatives*. Executive Summary. Denver, CO: University of Denver, Denver Research Institute.
- Kimberly, J., & Evanisko, M. (1981). Organizational innovation: The influence of individual, organization and contextual factors on hospital adoption of technological and administrative innovations. *Academy of Management Journal*, 24(4), 689-713.
- Loughary, J. (1977). Technology and Counseling. *Personnel and Guidance Journal*, 55(6), 346-351.
- Margulies, N. & Colflesh, L. (1982). A socio-technical approach to planning and implementing new technology. *Training and Development Journal*, 36(12) 16-29.
- Nathanson, D.E. (1978). *A Proposal for an International Special Education Television Network*. Paper presented at the World Congress on Future Special Education. First, Sterling, Scotland.
- National Institute of Handicapped Research. (1980). *Strategies and Options for Change: A guideline for counselors*. Seventh Institute on Rehabilitation Issues, June 3-5, Dunbar, WV: West Virginia Research and Training Center.
- Office of Technology Assessment. (1982). *Informational Technology and its Impact on American Education*. Washington, D.C.: Author.
- Oklahoma Rehabilitative and Visual Services Division. (1980). *Telecommunications for Concerned Citizen Involvement: Executive Summary*. RSA Grant #12-57999. Author.
- O'Neill, J. (1976). *Guidelines for Identifying and Accessing Telecommunications Resources*. RSA Grant #22-57905-002. McLean, VA: Author.
- Park B. (1978). *Planning the use of telecommunications in Vocational Rehabilitation*. Washington, DC: Department of Health, Education and Welfare.
- Pease, P., Threlkeld, R., & McNair, L. (1982). *Establishing an audio teleconferencing network in vocational rehabilitation*. Portland, ME: University of Southern Maine, Human Services Development Institute.
- President's Committee on Employment of the Handicapped. (1979). *Producing a Public Relations Program for Disabled Adults*. Washington, DC: Author.
- Rayman, J. (1981). Computer-assisted career guidance for adults. *New Directions for Continuing Education*, 10, 85-94.
- Sampson, J., & Pyle, K. (1983). Ethical issues involved with the use of computer-assisted counseling, testing and guidance systems. *Personnel and Guidance Journal*, 61(5), 283-287.
- U.S. Department of Health, Education, and Welfare. (1971). *Selected approaches to expedite the delivery of vocational rehabilitation service*. Ninth Institute of Rehabilitation Services, Norman, OK: Oklahoma State University, Rehabilitation Counselor Training Program.
- U.S. General Accounting Office. (1982). *Advances in automation prompt concern over increased U.S. unemployment*. Washington, DC: Author.
- West Virginia Research and Training Center pioneers satellite workshops. (1982). *Programs for the Handicapped*, 12, 7.

Excerpts of Reviews and Comments

The following are excerpts of reviews, comments and questions raised by the Switzer Scholars. These are presented to further stimulate thinking, discussion and action as it relates to the content of CHAPTER 4 by Susan M. Bruyere.

Although I can agree with the author's view regarding the requirement of the counseling professions use of telecommunication equipment and methods of providing casework services. I have some difficulty with her description of the changes in the counseling process to include the needs of clients in this new job market. To say that we must all utilize the improved telecommunications systems in providing counseling services without describing the services themselves misses the mark somewhat.

Experiences with teleconferencing and electronic mail systems which have **no particular established agenda**, have not proven to be especially fruitful. If we can understand that technology of any kind is **not the end**, but only the means to an end, **a tool**, we will all benefit. Therefore, it is extremely important that the uses of these technologies be fully

developed and described with specific goals and objectives for each use **fully understood by all users**. Meaningful information exchange is a boom, while meaningless or obscure information is a bore.

--Joseph E. Traub

Dr. Bruyere stresses that "change" to be effectively incorporated in the vocational rehabilitation profession requires planning, action, careful review, and implementation.

The vocational rehabilitation counselor must assume a leadership role in guiding change so that new technologies and innovations are absorbed into the body of knowledge to assist disabled individuals achieve independence through rehabilitation and employment.

Bruyere's insight and keen sense of change, as

they apply to the high technology revolution are on target and commendable. She is advising us to change and accept the challenges and opportunities that high technology offers. If we do, both the disabled and the vocational rehabilitation profession will be the benefactors. To make progress we must insure that the technology revolution becomes **our ally and not our enemy.**

--Angelea Traiforos

The major emphasis I see in this paper concerns the problems generated by the communications explosion. These must be faced by teachers of rehabilitation workers, by the workers in the field, and by the directors of the concerned agencies, in order to get the best possible return in information and aid for the money and time spent in upgrading the current systems. This is a question well worth discussing, because the systems presently under development are such that it is not possible for very uneven levels of technology to exist among entities and still have complete or efficient communication among them. The upgrading is more like an all-or-none process, and the system to be converted must be carefully analyzed before the new technology can be intelligently imposed on it.

Dr. Bruyere's comments on this problem, which is probably central; to the whole question of technology and rehabilitation, are extremely insightful. It will be very helpful to enlarge on her points concerning the **program of education in rehabilitation technology.**

--Carl E. Sherrick

Assuming that the bottom line of vocational rehabilitation is employment, and I believe it is, the advent of high technology and the "information age" increases the need for a stronger relationship between rehabilitation and business and industry. Rehabilitation professionals need to become more familiar with business and industry, how it operates and what its needs are. Conversely, business and industry needs to learn more about rehabilitation, its resources and its services.

Addressing this concern for rehabilitation might include adding **internships in business** to both the initial training and continuing education programs for rehabilitation professionals. For business it might include communicating information about rehabilitation support systems, e.g., Rehabilitation Research and Training Centers, Rehabilitation Engineering Centers and Regional Rehabilitation Continuing Education Programs.

--Jay Rochlin

The VR counselor is seen as recipient of high technology -- not necessarily proficient in the areas of telecommunication devices; although encouraged to become "computer literate" -- VR counselors should be given a clearly-defined curriculum designed to enhance their particular needs and client population to be served.

Recommendations have also been made how Rehabilitation Engineering Centers, Rehabilitation Research and Training Centers and Regional Rehabilitation Continuing Education Programs could take an active role in this education process, but the question that remains to be answered is, how State Vocational Rehabilitation agencies and private rehabilitation facilities can tap this technological resource (Many of which are already available) to better prepare the severely disabled clients for the competitive job market. When the auto industry did not meet the U.S. population's demand for small cars, they were at the verge of losing business. Similarly, the vocational rehabilitation systems have to pay the consequences if they do not change their resource and techniques to cope with the current industrial trends.

Presently, disabled clients are facing competition with dislocated workers, and in many instances, the dislocated workers are learning skills needed in high technological fields through the community Job Training Partnership Program (JTPA), formerly known as CETA. Training via counselors alone would not help the clients to achieve the degree of proficiency to meet the challenge of dynamic changes. The vocational rehabilitation systems also need:

- 1) To develop new vocational evaluation systems in collaboration with industry to identify client's abilities in the newly emerging jobs.

- 2) To develop skill training programs integrating employers needs and where much of the training should be at the employers' site which is better equipped with techniques and tools to deliver such services.

- 3) To integrate such services as rehabilitation engineering, occupational therapy, job development and placement, so that persons with severe disabilities are trained and placed in competitive home-based or on-site jobs.

- 4) To develop coordination and cooperation with all community training programs like JTPA, vocational rehabilitation, community colleges, vocational education at public schools, state employment exchanges, Veterans Administration, Worker Compensation, and private rehabilitation facilities to avoid duplication and to facilitate realistic skill training programs.

5) To introduce a new course "technological aspects in the rehabilitation process" in the rehabilitation counseling field.

6) To introduce more degree programs in the areas of job development and placement similar to the one found at Drake University, Des Moines, Iowa.

7) To introduce computer services at State Vocational Rehabilitation agencies and private rehabilitation facilities, to store information on job tasks and clients skills for job and client matching.

8) To mandate that all vocational counselors carrying caseloads should spend a minimum number of hours at employers sites for job development, training, and the placement process.

9) To reward counselors who place the most severely disabled clients in challenging, complex and competitive jobs.

--Kali Mallik

Bruyere stresses the importance of the "human service deliverers" in utilizing the new technologies to help persons with disabilities. How can we better prepare counselors to accept the new developments? Teaching counselors to use desk-side computer terminals as an aid to case management and an information base for clients is essential now in updating preservice and continuing education programs.

Counselors must also be prepared to counsel for the future. Knowing implications of new technologies and anticipation of the abilities needed for their applications, are essential to helping clients get ready for employment for the next five to ten years. The accelerating changes will probably mean that life-time career planning will not be possible. At most we may only be able to plan and prepare for the next five to ten years. Rather than life-long career planning, we might prepare people for periodic career counseling. Like dentists who sent out six-month notices for examinations, counselors may need to review career plans with clients on a periodic basis. Computers can help keep track of case records and notify counselors of the need to review cases over long time periods. Increasing improved computer memories can and should significantly change practices in counseling for years to come.

--Donald C. Linkowski

The following points are presented to reinforce the author's points and include:

1. In some respects, the success of adapting high technology to the field of vocational rehabilitation

will depend on the functions location in the state hierarchy. In many cases, the fact that vocational rehabilitation departments are located in a "social welfare" context **frustrates the application of high technology solutions to vocational problems.** Additionally, strong leadership will have to be present in order to insure that vocational rehabilitation personnel can effectively utilize high technology. Hardware/assistive equipment cannot exist in a vacuum, in order to be effectively used, strong leadership and management styles consist with creativity and innovation must be exercised.

2. The role of the Rehabilitation Engineering Centers (RECs) will have to be modified if they are to be an effective instrument in the application of high technology. At the present time, NIHR restricts the activity of these centers to **one of primary research. In order to be effective in the service delivery and training mode, the fundamental objectives of the REC's will need to be expanded.**

3. **Counselors, in order to effectively utilize high technology with the adult clients, will have to interrelate more closely to the special education school system.** Counselors can be effective instruments in acquiring the special education teacher with the advantages of high technology, particularly as related to productivity in vocational environments. Additionally, the vocational rehabilitation counselor must take an active role, even on the secondary education level, to encourage special education teachers to foster career goals and objectives in disabled students. We are literally spending billions of dollars on special education with no service delivery system at "the upper end."

4. Placement agencies such as Projects With Industry (PWI) do not deal with the multiply handicapped, severely disabled person. For example, recent statistics published by the Electronic Industries Foundation indicated that they deal with cerebral palsied individuals only 10% of the time. It should be realized that the severely, multiply disabled person can be productive on the job through rehabilitation engineering applied to labor productivity. At the present time, there is not a service delivery system to pay for the implementation of high technology the vocational environment for persons who desperately need them. The design, fabrication, installation and maintenance of assistive devices for the disabled worker cost money. **An integrated service delivery approach is needed** in order to insure that this money will be available on a timely basis.

5. The vocational rehabilitation counselor must not only take courses in the application of computers and telecommunication to the rehabilitation

process, but should also be encouraged to **take entry level courses in industrial engineering**. Job development, job restructuring, and assistive device implementation are largely functions of industrial engineering. Obviously, the vocational rehabilitation counselor does not need the same level of course work provided to the professional engineer. However, exposure to the concepts would certainly be beneficial.

6. The use of teleconferencing to acquaint vocational rehabilitation professionals with the applications of technology is an excellent idea. However, teleconferencing can create an "antiseptic" environment if individuals are not acquainted with assistive hardware. The reviewer would encourage persons developing teleconferencing seminars and short courses for vocational rehabilitation professionals to provide hardware to each individual group in order that they may see, firsthand, what an adaptive device looks like. The reviewer has had much experience in the presentation of the application of assistive devices to the vocational realm and has discovered that the ability to examine actual hardware is absolutely essential to understanding the rehabilitation engineering process.

7. The Rehabilitation Engineering Society of North America (RESNA) would seem to be a worthwhile centralized vehicle for providing training for vocational rehabilitation professionals, particularly related to the application of rehabilitation engineering. RESNA is a national society and could provide the focal point for **nationwide training for vocational rehabilitation counselors**.

8. The Rehabilitation Engineering Centers, as well as the RTC's and RRCEP's, could serve as a catalyst to provide information to an organization such as RESNA for dissemination to vocational rehabilitation counselors. The cost associated with such an activity should have to be borne by either federal funding agencies or by state vocational rehabilitation departments. The telecommunications concept of dissemination of rehabilitation information is an excellent idea but in most cases REC's, RTC's and state agencies, do not have the money to support it.

The utilization of telecommunications through satellites is an important means of disseminating information relative to the application of high technology to the problems confronting persons with disabilities. It should be fostered, nurtured and, more importantly, funded.

--JOHN H. LESLIE

The challenge for rehabilitation is to recognize and grasp the opportunity at hand. The new

technology is advancing so rapidly that **we may be left so far behind that we may never be able to catch up**. We must insist that rehabilitation be a part of this new development. For example, we hear of major computer companies donating equipment to entire school systems. This did not happen by chance, schools systems actively sought help in this area because of decreasing budgets. What about the donation of such **equipment to rehabilitation facilities or agencies**? What about the donation of programmer time to write programs that could be used in the rehabilitation of disabled persons? Have we in rehabilitation actively sought or even expressed an interest in such assistance? Are we reaching for the opportunity as the school systems are?

Dr. Bruyere very trenchantly describes for us some of the most important activities that need to be accomplished if we are to accept the challenge. We must first define what it is we want and what needs to be done. There must be increased communication among rehabilitation professionals regarding the new technology at local, regional and national levels. We must know what is being done.

It is essential that rehabilitation counselors and other rehabilitation professionals be computer "literate" if they are to function effectively in a high-tech environment. Agencies must provide, not as a luxury, but as a necessity, educational opportunities and technical resources to this end.

ROBERT J. GILMORE

As documented by the author, the high tech environment is certainly changing the role and function of the rehabilitation counselor. This is particularly true with respect to relieving counselors of "paperwork" and allowing them more time to utilize their professional counseling, coordinating, diagnosing, and planning skills.

A management tool becoming increasingly popular in the private section is Distributive Data Processing (DDP). Technically, this is the decentralization of computer communications capability throughout an organization. This decentralization could be accomplished by having a centralized mainframe computer as the central processing unit and decentralizing terminals in strategic and accessible locations within the organization.

The rehabilitation enterprise must employ DDS more widely to take full advantage of the capabilities provided by the computer era. Rehabilitation counselors could have access to computer terminals. Each counselor could have a password which when used with a combination of other input data such as the client's social security number can enter the system and output on the

CRT or hardcopy on the printer. Some examples of potential uses of a DDS system included the following:

1. With what may be called Computer Assisted Caseload Management (CACM), the counselor can make numerous daily decisions and perhaps quadruple the number of cases he/she presently attends in a given period of time.

2. A program could be written that would produce a listing of appropriate "similar benefits" given the input of certain keywords by the rehabilitation counselor.

3. The counselor could key in his/her password each day along with a predetermined code and receive on the CRT a listing of decision points for that day, the previous week, or those planned for the coming week to facilitate caseload management and case management.

4. Medical transcribers can input the client's medical report on a computer terminal at the doc-

tor's office and the counselor can call it up within seconds on her/his office terminal.

5. Counselors can obtain leads on where they may look for **training and employment or opportunities by inputting certain keywords** obtained from the client's vocational evaluation reports and other sources.

6. The counselor can dictate each time it is appropriate (i.e., following phone contact, interview, or for eligibility or IWRP [individualized plan] statements). The case aide can call up the case to be continued and pick up where he/she left off and document the dictation.

DDS is used in the private sector and is obviously needed in the public sector more extensively than presently exist for management of vocational rehabilitation programs as well as for caseload and case management.

TED M. DANIELS

Sources of Recommendations

The following is a summary of the recommendations and implications for action developed by the Switzer Scholars as they relate to the topic of the fourth chapter. (The recorder was John H. Leslie)

1. Service Delivery Issues

A. Develop client ability bank and current job listing data by region - similar to Connecticut Goodwill Industries model.

B. Utilize computers to reduce turnaround time for client data such as:

1. Medical information

2. Evaluation reports

C. Job evaluators/placement specialists should interact more with community employers to develop job availability data.

D. Utilize computers to analyze severity of clients disability to determine a weighted caseload system.

E. Collect historical data to develop new bases for job placement, experience data can be used to create new strategies for dealing with severely disabled person.

F. Develop integrated (single source) funding sources for devices for severely disabled people (children and adults).

G. Provide employer training programs through telecommunications/computer media, i.e. low back pain/injury.

H. Use public TV for informational purposes to acquaint the general public, clients, and rehabilitation professionals on:

1. Technology as related to specific disability groups.

2. Technology related to individuals disabled people.

3. Technology for the general public - how it can assist people in their everyday lives.

4. Technology related to the rehabilitation professional.

5. Technology for management decision-making.

I. Many data bases currently exist (ABLEDATA), means should be provided to determine which device should be prescribed in individual cases.

J. A local technical "hot line" should be established to relate available technology to client need.

K. The "electronic cottage" could be effectively utilized by rehabilitation professionals in remote areas, e.g., Alaska.

2. Policy and Program Development Policy Issues

A. Financial resources of the U.S. must be reallocated to the population who requires technology assistance.

B. The productivity of disabled workers should be subsidized through:

1. Tax incentives.

2. Piece rate plans based upon minimum cost to employers.

C. Disabled representatives should be members of the Office of Technology Assessment, an arm of the United States Congress.

D. Incentives should be given to counselors who serve severely disabled clients such as:

1. Financial bonuses.

2. Additional vacation time.

3. Promotional opportunities.

4. Differential status.

E. Trade-offs should be made between wage benefits and social welfare benefits to minimize disincentives to employment.

F. Must support deinstitutionalization by adequate, integrated funding including the appropriate enabling technologies for employment and independent living.

G. Zoning laws and lease agreements must be modified to encourage the "cottage industry" approach.

H. A system of information transfer must be developed to facilitate coordination between rehabilitation agencies and the community.

I. Information transfer systems must be created to link:

1. Community training programs (JTPA, VR)

2. Community colleges.

3. Vocational education programs.

4. State employment programs.

5. Veterans Administration.

6. Worker's compensation agencies.

7. Private rehabilitation agencies.

J. Provision of joint funding for informational/training videotapes should be made between state and federal rehabilitation agencies.

3. Training Issues

A. Introduce new courses in VR training/educational programs which stress technological applications (computers and assistive devices).

B. Computer literacy should be a prerequisite for master's level VR curricula.

C. The Department of Education should develop a policy which requires computer competency for all programs receiving federal funds. This should also be required by appropriate accreditation agencies.

D. Courses/seminars should be established to provide administrators/professionals generic

training in computer technology through incentives such as:

1. Time off with pay.

2. Travel/per diem stipends.

E. Training grants through federal government agencies should contain a mandatory clause requiring computer literacy for VR staff on a regional/local basis.

F. Degree programs on job placement/job development must be encouraged which will marry the **disciplines of business and rehabilitation education**.

G. The role of the counselor must be redefined in the computer age, more emphasis should be placed on **information dissemination** than on traditional psychological interaction with clients, such as:

1. The ability to use a computer effectively.

2. Knowledge of computer data banks and how they relate to the problems of disability.

3. Applying appropriate evaluation instruments to measure competency in newly emerging occupations (Council on Rehabilitation Education).

4. CORE should examine the "mix" of skills/competencies necessary for rehabilitation professionals to better serve the clients now and in the future.

5. Existing models of educational core/specialized curricula should be examined for possible implementation in the field of rehabilitation education.

H. Rehabilitation educators should embrace technology as a means of better information dissemination.

4. Research Issues

A. The REC's role should be broadened to include training and service delivery components.

B. Effort should be devoted to identify the emerging jobs which will be brought about by technology.

C. Develop enabling technology to assist the disabled entrepreneur to enter business and/or industry.

D. Job development/technology and its relationship to the small business must be researched to optimize benefits to both the business and disabled employee.

E. Communications technology must be utilized to disseminate research information to the practitioners who need it.

F. Technology information must be integrated into the sheltered workshop community.

G. Provide funding for research of the differences on the impact of technology on non-

white disabled groups and white disabled groups.

H. Technology research money should be allocated to **prevent disability**.

5. **Legislative Issues**

A. More money must be allocated for every segment of rehabilitation, including but not limited to:

1. Delivery of service.
2. Research - applied.
3. Training.
4. Information dissemination.

B. The **creation of a cabinet level post** to coordinate all U.S. rehabilitation programs should be given immediate priority in order to:

1. Justify the expenditure of funds for special education.
2. Make emerging technology available to disabled people.
3. Validate the economic/productivity advantages of the rehabilitation process.
4. Facilitate the accountability and effectiveness measurement of rehabilitation programs.

C. In lieu of the above, **develop an executive authority in an Office of Technology Assessment** with a component devoted to technology for the disabled.

D. New legislation should be introduced to force compliance in the hiring of disabled people which will replace current, **ineffectual affirmative action programs**.

6. **Miscellaneous Issues**

A. Integration of technology assistance should take place **as early as possible in the life of the disabled child**.

B. The transition of the disabled child from secondary to post secondary education to a productive career should be facilitated by technology applied to prevocational and vocational education.

C. Develop media promotions to highlight success stories of persons with disabilities.

D. Establish public policy that will have the effect of insuring equal opportunity in the access of computer knowledge and skill development to poor, disabled, and non-white segments of society.



HONORED: All 20 Switzer Scholars are honored each year with a beautiful certificate from the National Rehabilitation Association. Here the presentation is to 1983 Scholar, Lawrence A. Scadden, center. He's flanked by NIHR Executive Director Douglas A. Fenderson, left; and Switzer Seminar Coordinator Dr. Leonard G. Perlman. -- Photo by Department of Education.

Final Scenes



CORNERED: Posing in the corner of the reception room were, left to right, Dr. Leonard Perlman, Seminar Coordinator; Dick Dietl, Associate Director of NRA; and Maria Flores-Ysita, staff member of Congressman Edward Roybal, (D-Calif.)



VISITS AND HOSTS: Two Scholars, present and past, had time for a visit at the Reception in the top picture. Scholar Gopel Pasi, left, visits with 1981 Scholar Fran Lauder. In the lower picture hosts Dr. Eugene Kelly, Jr., left, and Dr. Donald Dew were two of the super hosts from The George Washington University who staged the 1983 Switzer Seminar.



Switzer
Scholar
McLaughlin

Chapter Five

The Future of Information Technology and the Role of the Rehabilitation Professional

By Don McLaughlin

Introduction

Technology provides hope for many of the world's problems. We tend to view technology as the solution to most expressed problems. This is, of course, an appropriate perspective since technology is, at least in a sense, the conversion of knowledge and theory into practical and useful procedures and devices to satisfy particular needs. This view is also supported by observation. That is, as a whole technology has been impressively successful in solving the problems that it was intended to address.

It is worth noting that the impact of technology on society is not on a "one for one" basis with respect to the problems it is intended to address. A single technological development for the solution of a specific problem can result in the propagation of other technological developments based on all or part of the original developmental effort. Major technological efforts can produce massive amounts of this "spinoff technology." One of the most noteworthy examples of this is the United States' project to put a man on the moon. Clearly the cost/benefit ratio, in terms of an immediate analysis, of having Neil Armstrong walk on the moon would be breathtakingly high. However, efforts to accomplish this objective resulted in the technological developments which were adapted,

adopted or integrated to produce countless new devices or procedures for use for society in general. Today we benefit from these spinoffs in areas such as medicine, communication, and construction to name just a few.

Knowledge of things to come provides us with the opportunity to prepare for them. Knowledge of the technological future allows us to anticipate the consequences of technological developments and organize ourselves to exploit them to our maximum benefit. Unfortunately, we cannot know the future with any degree of certainty. This is especially true when the field of observation includes such complex entities as society. The future does, however, build upon the present. Thus, we can make judgmental or probabilistic predictions of the future based on observations of contemporary events and the regularity with which the events evolve across time.

The purpose of this paper is to examine the technological future and its impact on the role and function of rehabilitation and, more specifically, the rehabilitation professional. In particular, this paper will focus on the future of information technology and how it will effect the professional practice of rehabilitation. This limitation in the scope of the paper is based on two factors. First among these is that we are currently in the midst of an information technology revolution of massive

proportions. Few offices, businesses, and organizations have not had some contact with this technology in the form of word processors and computers. Our entire society is now grappling with the implications of this revolution in terms of the way we do our work, dispose of our leisure time, and conduct our daily lives. Secondly, although there are other areas of rapid technological advances, such as lasers and telecommunications, none seem likely to have as radical and pervasive an impact on society as information technology. Few of us will be untouched by this technology in the near future.

The data upon which the predictions are made are not based on a systematic data collection effort such as a survey or a poll but rather on a broad base of observations of technology and trade literature as well as current market trends. The projection derived from these observations were guided by several arbitrary axioms that seem pertinent to such a task. Thus, these axioms determine in part the kind of extrapolations that can be made from observations of current events. These axioms are described below:

1. Long term predictions must be general in character. Any prediction has a level of uncertainty associated with it. Even detailed mathematical models can render imprecise or inaccurate predictions if certain unknown or unexpected factors exist. The passage of time increases the likelihood such "external" factors will dampen the power of a model in terms of predicting specific events or relationships. Thus, it seems unlikely that we could predict, with any degree of accuracy, the number of persons with a given disability that will be served by a particular rehabilitation center ten years from now. This is due to the large number of variables or factors that could impact that population or the service delivery system by then. Hence, it would be meaningless to make such a prediction.

Broad generalizations or predictions are much less likely to be effected by such intervening variables. That is, it would require a relatively catastrophic phenomenon to significantly alter the general course of events. We generally believe that broad trends deviate very slowly, if at all, from their anticipated outcome, and even then only when impacted by major events.

2. Short term predictions should be specific. Short term predictions typically involve a forecast of a specific event or phenomenon. Statisticians and mathematicians have developed sophisticated procedures for making predictions of this type. If applied properly these procedures often result in prediction with high levels of accuracy. This

is not to suggest, however, that short term general predictions would be inaccurate. Rather, the general scheme of things tends to change, at least perceptibly, very slowly. A short term prediction concerning a general event or phenomenon such as a culture or the American labor force, for instance, would probably be insignificantly different from the present. Hence, there is no compelling reason to make such a prediction.

3. The future of technology is largely market driven. Most of the technology commonly available in our society has been made available by private, for profit, corporations. Although federal sponsorship of research and development projects is responsible for significant amounts of technological innovation it is usually left to private companies to translate these developments to consumer products and services. This model for the dissemination of technology is likely to continue for some time.

A fundamental principle of business is that one does not invest resources in something that is not expected to ultimately provide a positive return on that investment. Thus, a company will not often perform the research and development necessary to produce a technological innovation unless it is expected to be saleable. This principle, coupled with the preeminent role of private industry in technology diffusion, determines in large part the types of technological innovations that are produced and made available. In general, then, only those technologies that are perceived to be potentially profitable will reach the market place.

4. The future is controllable. We often attempt to peer into the future as if it is destiny - something that will just happen. This seems to be especially true with respect to technology. We imagine that home or the car of the future and frequently seem to believe that these things will just materialize with the passage of time. This is, in part, due to a presumption of the inherent marketability of these future technologies. We often seem to overlook, however, that we can control the future. Collectively and sometimes individually we can exert influences that can shape the future. These influences can, in effect, create the market forces necessary to stimulate technological innovation and its integration into society. Accomplishing this successfully requires considerable forethought and a clear vision of what can be as well as a high level of determination to see a particular future unfold.

The generalizations, extrapolations, and predictions discussed in this paper are based on a large

number of observations from the field of computer science and rehabilitation and comments and opinions expressed by others interested in the future of technology. Further, the formulation of these predictions have been guided by the axioms presented above. Hopefully, this process will not have produced biased or distorted predictions.

The forecasts made here are general in nature dealing with broad issues and trends. No attempt was made to predict specific events or phenomena. The predictions also tend to be concerned with long time frames (two to ten years) and while avoiding near term projections (one year or less).

In order to examine the future role of rehabilitation professionals, it is necessary to look into the evolution of major factors having an impact on them. Accordingly, this paper will discuss the nature of information technology and the future course it is likely to take. The discussion will also deal with the impact of information technology on the rehabilitation client since this has obvious implications for the rehabilitation professional. The rehabilitation professional will then be examined in terms of the way these factors will affect the role of this professional in the future.

The Evolution of Informatica Technology

One of the most dramatic areas of technological development of this century has been in the field of computers. In less than forty years these machines have evolved from physically gigantic devices with very little computing power to literally microscopic devices with astonishing compute power. In fact, the first stored program computer, developed in the late 1940s, filled a large room yet possessed only minimal compute power by current standards (Davis, 1977). Today, the processing circuitry of modern computers can literally rest on a person's fingertip. Furthermore, it should be noted that these microprocessors are far more capable than their early predecessors.

Early computers were built primarily from vacuum tubes such as those found in old televisions and radios. These tubes, which accounted for the machines' size, were prone to failure which resulted in very low reliability levels. This technology soon gave way to the use of transistors and later to integrated circuits as the primary building blocks of computers. These latter devices, which initially contained only a few electronic components, now are composed of hundreds of thousands of transistors, resistors, etc., on a small piece of semiconductor material (Boraiko, 1992).

The development of integrated circuits initiated

an intense competition within the electronics industry to develop more powerful and densely designed circuits. By the early 1970's this competition had resulted in the development of the circuitry of a complete computer central processing unit(1) on a single chip, known as a microprocessor. Shortly thereafter, several companies began to market microprocessors with greater speed and more features than their predecessors. The competition to develop a better microprocessor has not abated.

Early microprocessors were eight bit(2) machines. That is they could operate on eight bits simultaneously. This is known as the machines' wordlength. In general, all other things being equal, the greater the machine's wordlength the more powerful the machine. In fact, one classification scheme often used to denote computer power labeled machines with wordlengths of eight bits or less as microcomputers (in part because they were built from microprocessors), 12, 16, and 24 bits as minicomputers(3) and more than 24 bits as mainframes.

The race to build a better microprocessor has primarily taken the route of building a more powerful processor. This is to some extent translatable to building a machine with a greater wordlength. This, while the original microprocessors were eight and occasionally four bit devices, it was not long before chip manufacturers began producing 16 bit processors. Even though these new machines were not comparable performance-wise to their minicomputer counterparts they did represent a significant advance in microprocessor power. Continuing improvements in chip design did, however, ultimately result in microprocessors that out perform all but the most powerful 16 bits minicomputers.

Unsatisfied with this level of technological development computer designers have continued to expand and refine microprocessor chip. Several computer and integrated circuit manufactures have announced the development of 32 bit microprocessors. This is, in terms of wordlength, within the range of large mainframe computers. Furthermore, these new 32 bit microprocessors perform at levels comparable to and sometimes exceeding that of many mainframes.

Another area in which integrated circuiting is undergoing tremendous advances is computer memory(4). At the time that microprocessors were introduced, memory technology was gradually shifting from systems of magnetic metal rings known as core memory to the use of memory in the form of integrated circuitry. Then, a 1K (1024) bit memory chip was considered large. Gradually,

manufactures began to produce 4K and 16K memory chips. Today, 64K bit memory chips are relatively common and 256K bit memories are becoming available. One company recently announced that it will soon make available a 512K bit memory chip.

Perhaps the most intense competition in the electronics industry is centered around the development in high capacity memory integrated circuits. Several companies in several countries are working feverishly to develop and market a one megabit (1,048,576) memory chip. A few companies have announced that they have such a chip available in prototype form for customer testing. It is generally believed in the electronics industry that the company that first mass produces and distributes these memories will capture a substantial share of what is expected to be a very large market.

Most computers require, in addition to memories, mass storage devices. The purpose of these devices is to store programs and data not in immediate use by the computer. These can include magnetic tapes, disks, cassette tapes, and punched paper tape. The most common mass storage device currently used on computers is a magnetic disk(5). The performance of a computer system is, to a large extent, dependent upon the availability of a disk since the computer must frequently access programs and data stored there when not in use. Since most computers spend much of their time waiting for stored information, it is usually true that the faster the disk -- the greater the system's performance.

In recent years there has been considerable progress made in improving the storage capacity of computer storage devices, especially magnetic disks. Only a few years ago one might have expected to have a very capable personal computer with 100K bytes(6) of flexible disk storage. Now, a computer user can purchase, for not much more money, a hard disk with 100 times the storage capacity and having far greater speed.

This technology will continue to improve at a dramatic rate over the next few years. Already 10, 20, and 30 megabyte disk drives are available on personal computers. Disk manufacturers will continue to develop disk drives with greater and greater capacity and lower cost per unit of storage. In fact, it seems very reasonable to suggest that we will see one billion byte disk within the next five to seven years.

Considerable research and development effort is going into making computers easy to use from a hardware standpoint. That is, computer devices for enabling communication between itself and its human user are not necessarily optimum for this

purpose. Many organizations are actively involved in the redesign of computer equipment to be more compatible with the human user, with computer display terminals being the primary focus of this attention. As a result of these efforts most terminals now possess a number of enhancements to make them more conducive to human use, such as low profile keyboards, glare reduced screens, tiltable displays, etc.

In spite of improved designs from a human factors viewpoint, computer/human interface devices can be difficult to use. The typewriter style keyboard used on most computer terminals and personal computers can be impossible to use for someone with a manual dexterity limitation such as arthritis. Several alternatives to the keyboard have been developed for inputting information to computers. One of these alternatives currently available on several personal computers is known as a mouse. This is a small handheld device that can be moved around on a flat surface. The computer senses the direction and distance of the mouse movement and uses this information to reposition a pointer (called the cursor) on the computer display. This can be a very effective input device if it is used with software designed to be controlled by pointing and picking options. A functionally similar device available on some computer terminals and at least one personal computer is a touch screen. This apparatus allows a user to select an option or an object by simply touching the item as it is displayed on the screen. The computer or terminal can determine the location of the touch through a coordinate system and in turn make the appropriate response.

Two other human interface areas which are receiving a great deal of research attention are speech synthesis and voice recognition. The speech synthesis, which allows a computer to speak with an audible voice, has been fairly well developed. A number of speech synthesis devices are currently available for a variety of personal computers and a few manufacturers market talking terminals. Currently one of the primary limitations in the area of speech synthesis is that the generation of intelligible speech usually requires a significant amount of computer resources, thus distracting the computer from other tasks that it might be performing.

Voice recognition, as the name implies, provides a computer with the ability to understand human speech. This field is significantly less well developed than speech synthesis largely because it is much more difficult. This task requires enormous computer resources to compare coded patterns of speech with "templates" of known words or phrases. The computer must be capable of making the ap-

appropriate generalizations among numerous variations of the same word or phrase and the appropriate discriminations among various words or phrases sounding similar. While a few voice recognition systems are commercially available, most have very limited recognition vocabularies and often can recognize the voice of the one person that it has been trained to understand. Further, the error rate for most of these systems is so high that they cannot be used for any serious applications. This situation is likely to change in the future, however, since this area is the subject of intense investigation in a number of research facilities.

Every indication shows that computer hardware technology is advancing at an alarming rate. This makes it difficult to fully imagine what the next ten years will bring. Yet several trends seem apparent. Perhaps the most obvious of these is that computers will continue to grow in terms of their power and capabilities while physically shrinking in size.

In spite of the overall trend, the race to build a better, more powerful microprocessor will probably plateau sometime in the near future. As mentioned earlier, several semiconductor manufacturers are developing or already marketing microprocessors with 32 bit wordlengths. There will probably not be a concerted effort to go beyond that point in microprocessor design. This is not because the designers have reached the limits of the technology, but rather because there is probably not a market for a functionally bigger device (except perhaps in specialized equipment). This prediction is based primarily on the fact that this is the same point at which mainframe processors plateaued, although the technology would have clearly allowed bigger machines to be built. The only notable exception to this has been several special purpose supercomputers used in heavy computer load applications such as weather tracking.

Memory and mass storage technology will probably continue to improve for some time. The storage capacity of a memory chip determines, in large part, the amount of memory that can be packaged in a computer system of a particular size and consequently the power of that computer. Thus, memory designers will attempt to design memory with even greater densities. This will probably continue until the physical limits of the semiconductor material are reached. Designers of mass storage devices, especially magnetic disks, will pursue greater densities and better performance in these machines. Disks will increase in capacity as well as performance until one of two things happen -- designers reach the physical storage limits of available media or they become large enough to

hold more information than everyone would reasonably want to store. In either case, this will not occur for several years.

More important than the discreet components is the nature of computer systems. In this respect, there are two major predictions or implications that can be derived from contemporary observations. The first of these concerns the increasing power of personal computers. Up to now, the term personal computer has been synonymous with the term microcomputer. The clear implication of this association was that these systems are functionally small and minimally capable. New computer technology, however, makes the issue of designing or building a personal computer one of configuration rather than capability and capacity. That is, the availability of 32 bit microprocessors and high capacity memory chips and disk storage will in the not too distant future, result in the marketing of personal computers that are, in terms of computer power, functionally comparable to large computer systems. (It should be noted that a few companies have already started doing this). In fact the only distinction between personal computers and large computers will be whether or not they are designed to be used by one user or many users. No longer will it be possible to equate the term personal computer with microcomputer.

Currently there are a number of categories of computers - micros - minis - superminis, etc. The second major prediction is also based on the increased capability of personal computers. In the past the taxonomy of computers has served primarily to express the power of the machine. The power of a personal computer will soon evolve to a point that will make previous classification schemes meaningless. A personal computer containing a 32 bit microprocessor, 4 megabytes of memory, and 200 megabytes of disk storage would most likely out-perform many mainframe computers and most present day minicomputers. Thus, it would not be helpful to continue to refer to computers in the previous categories. Instead a new taxonomy will probably emerge containing only two classes - personal computer and main computer. The primary distinction between these two classes of machines will not be computer power but rather whether or not they are configured to support one user or many users. The sizes of various computers will fall along a continuum based on the work that must be performed instead of the major categories as it has the past.

Lastly, it should be noted that in the future a variety of hardware options will be available for computers to make them easier to use, such as touch

screens, speech synthesizers, and voice recognition systems. Each of these will significantly extend the utility and ease of use for all types of computer systems.

Another major revolution is underway within the field of computers involving computer software. Although it is not as visible as the impressive gains made in computer hardware, it is no less important. In fact, some argue that it is THE important one (Feigenbaum and McCorduck, 1983).

Computer software is the collection of instructions and information that the computer needs to perform a given task. Without software any computer is simply an inert mass of electronics.

All computer instructions and data are, at the time of execution, binary numbers encoded electronically within the machine. Early in the history of computers, programming was a matter of appropriately sequencing such binary numbers and entering them into the computer often through switches. This was fine for the computer since the instructions were presented in a form that it could execute but it was very cumbersome for the programmer. He or she had to remember the long list of cryptic codes and the corresponding actions of the computer. The necessity of programming in this manner posed serious limitations on the program production capabilities of human programmers. In order to circumvent this constraint, programmers soon developed programs that allowed other programs to be expressed in a form other than the cryptic binary or machine language. Hence, a programmer using such a program, known as an assembler, could develop a program using instructions somewhat resembling English and have these instructions automatically translated to machine instructions and executed.

The availability of assemblers lead quickly to the development of higher level languages. These languages provided programmers with the capability to instruct computers in a form reasonably close to English. This greatly facilitated programming efforts and significantly enhanced programmer productivity.

Using these languages, programmers develop, among other things, applications programs. These programs are designed to do a particular job or satisfy a routine user need. A payroll program, for instance, would be an example of an applications program. Such programs are typically designed to read information in a specific format, perform a well defined task with the information and output the results in a certain way. Modification of any of these components would require a virtual redesign of the software.

The advent of personal computers has placed new demands on how a computer can be used. No longer could it be expected that a computer would be accompanied with a cache of programmers to "train" it in the jobs that need accomplished. Instead, the task instructions would be provided by a user who in most cases had no background in programming. Thus, many companies have now developed a variety of general purpose software void of any task content but providing the user with the tools that would apply in a wide variety of tasks. Several programs, for example, provide the user with a computer representation of an accountant's spreadsheet. The user can fill in the blank "sheet" with any type of applicable information and express simple and complex relationships among the row, columns and cells of the table. The same program can be readily used for a wide variety of discrepant problems simply by changing the content of the "sheet."

Even though this general purpose software is highly versatile in terms of the types of applications in which they may be applied there is still a great deal of incompatibility across applications programs. That is, typically the information used or produced by one general application program is not usable by another general application program due to format incompatibilities. A number of general purpose graphics packages are, for example, available on a variety of copiers. Some of these programs can do an excellent job of representing data graphically. However, there is typically no way of incorporating a graphic produced by such a program into a document produced through a word processor on the same computer.

Recently a new approach known as integrated software has been provided by a few software developers. Although not fully developed, this approach alleviates many of the cross program compatibility problems. For example, through an integrated software system, a user could develop a report using a computer word processor incorporating a budget developed with a spreadsheet program and graphics obtained from a general purpose graphics program.

The near term future of computer software will primarily involve the development of powerful packages designed for a variety of general application areas. This will include the development of highly sophisticated word processing and modeling software packages, among others.

The next major phase of software evolution will probably be the biggest one. A number of companies and universities are making heroic attempts to develop software for the fifth generation of computers usually referred to as Artificial Intelligence

(AI). According to Feigenbaum and McCorduck (1983), the company and country that first masters the development of fifth generation software will ultimately dominate the world computer market.. In fact, Japan has made the research and development of fifth generation software a major national objective.

Conventional computer software consists of a detailed set of instructions following a precisely defined algorithm for the completion of a task. The computer will obey these instructions -- even if they are in error or inappropriate for a particular situation. The field of artificial intelligence, however, is concerned with the development of computer software that is capable of making inferences and discretionary decisions. An artificial intelligence program might, for example, be designed to make medical diagnoses. Such a program would query a patient regarding the symptoms of the patient and draw probabilistic conclusions regarding the nature of the illness and, in some cases, the prescribed treatment.

The importance of fifth generation computer software lies in the fact that, with it, computers could perform tasks currently believed to require considerable intelligence. The implications of this are substantial. Through these systems, expert medical advice will be equally available in New York City and the African wilderness. Computers will become valuable counselor to air traffic controllers. Intelligent educator computers will be able to develop hypotheses regarding a student's misunderstanding of a topic, test the hypothesis by questioning the student, and, based on the confirmation or rejection of these hypotheses, implement prescriptive curricular sequences.

Not all computers and computer applications of the future will involve the use of artificial intelligence techniques. A variety of general application packages, such as word processors, will remain available although they will become more powerful with the passage of time. However, as fifth generation software techniques become more sophisticated and readily implementable, they will begin appearing not only in expert systems but in general purpose packages as well. Word processors, for example, are likely to include grammatical analysis features and recommend wording and sentence structure changes in text upon request. Ultimately, most computer systems will possess some artificial intelligence capability if only to facilitate dialogue between the computer and its human user in the human's language.

Another important aspect of information technology is that of information or data base ser-

vices (Siwolop, 1983). These services provide on line availability of often large information resources or data bases. The data bases may contain information on a specific topic or on a wide variety of diverse topics depending on the interests and needs of its hosting organization. One data base service provides access to indexation and bibliographic information on a broad range of scientific, professional, and technical fields as well as the Federal Register and the status of current legislation.

The Encyclopedia of Information Systems and Services (Schmittroth, 1983) contains information such as content area, availability and accessibility of more than 1,500 on line data based/information systems. Many of these systems are publicly accessible through conventional telecommunications networks. Hence, anyone, anywhere with a computer terminal or a personal computer can have fingertip access to a global encyclopedia of information on almost any topic. Users of these systems can, via telephone lines, retrieve up to the minute information on research in a field of interest, the latest stock quotations or the Encyclopedia Britannica, for example.

A variation of this type of information service is a home interactive video system known in this country as videotex. Users of these systems can, through a special terminal and standard telephone line, connect to a network of information concerning the local community. Through such a system a user can, from his or her home, "browse" through a department store or grocery store and select items for purchase and have these items prepared for pickup or home delivery. Such a system will also provide users with access to local and regional news before it is published in a newspaper, and national and international information resources such as the stock market and the New York Times.

These interactive video systems are not widely available yet, but they are being experimentally tested in a few locations. It is reasonable to expect, however, that by the end of this decade they will be available in some form on a widespread basis.

The discussion presented above does not represent an exhaustive review of information technology as a whole. Rather, it has been an examination of dominant trends in the field of computer and information technology that will probably have a major impact on our society over the next ten to twenty years. The discussion now turns to the likely impact that this technological evolution will have on rehabilitation clients and rehabilitation professionals.

Impact on the Rehabilitation Client

The revolution of information technology and its consequent impact on society, in general, is already well underway. We currently encounter instances of the new technology on a daily basis. The information technology now available is rapidly changing the way we do things. A traveler, for example, in Los Angeles can "visit" his or her bank in Atlanta via a network of computer based automatic teller machines. Household appliances are becoming even more intelligent due to embedded computer components.

The new technology will undoubtedly have a significant impact on the daily lives of disabled persons as it will on everyone else. Information services such as those described earlier will extend the ability of severely disabled persons to perform routine daily life tasks that they currently find difficult to do or that they are unable to do. Through such systems persons with limited mobility will be able to gather needed information as well as perform tasks such as shopping, banking, and correspondence from their home. What will amount to a convenience to the nondisabled person will be new found capability for many disabled persons.

Most of us, at some time or another, have dreamed of the time when we would have a robot that could vacuum the living room and do other household chores. Such a device could be of tremendous service to disabled persons. While no practical household robots now exist, industrial robotics provides the base technology for the creation of such a machine. It is entirely feasible that someday household robots will be available to serve, at least to some extent, as personal care attendants for severely disabled persons.

The field of artificial intelligence also possesses important potential for rehabilitation and disabled persons. An intelligent computer system might one day serve as an assistive device to a cognitively impaired person. Thus, a person with a memory deficiency might be supported by a computer capable of assessing the person's information needs and making the appropriate information available.

Clearly, the largest impact of information technology has been in terms of the world of work. This is likely to continue to be true for some time to come. Naisbitt (1982) has suggested that we are currently in the middle of a major transition from an industrial society to an information society. For some time now the majority of the American labor force has been composed of service providing workers in contrast to goods producing workers. This disparity between these two groups continues

to increase year by year. As Naisbitt points out, however, almost all of the growth in the service sector of the labor market is due to the expansion of the information segment of the economy.

The transition from an industrial to an information society has a number of obvious (and some not so obvious) occupational implications. The rapid expansion of information related jobs relative to industrial jobs and the computer's preeminent role in the information economy has led to the widespread belief that computer literacy would be equated with occupational success. Unfortunately, the belief has been largely operationalized as "Everyone needs to know how to program." Consequently, there has been a mass invasion of existing programming courses and a proliferation of new ones. While a knowledge of computer programming will certainly not hurt anyone in an information related job, it, in most cases, will not help very much either. Ticket agents, bank tellers, and department store managers are all, in some sense of the term, information workers. The services of information technology is indispensable to most such workers, yet few of them would ever need to write a computer program.

The transition will result in a significant shake-up in the American labor market. Although its impact on the labor market is not fully understood, it does seem clear that there will continue to be an increase in information jobs, an intensifying of the information component of information related jobs, and a decrease in traditional industrial jobs. Anticipating the occupational implications of an information society may be a critical feature in the maintenance of a productive economy and an employed labor force.

Another effect of information technology on work involves the place work may be performed. Computer and communications technology make it perfectly feasible to perform many information related jobs in places other than the conventional office environment. This includes working in one's home. It is often proposed that the office as a work place will someday soon be a relic of the past, that most workers will work from their homes. The obvious advantages to such an arrangement would include reduced facility and utility costs to the employer and reduced transportation expense to the employee.

Although "home work," as it is referred to, probably will grow somewhat in the near future, it is not likely to catch on as a dominant operational mode for most companies unless the advantages in doing so become great enough to overcome the social and psychological benefits of the office.

Home work as an option, however, can create and expand many job opportunities for disabled persons. By providing the appropriate equipment, a disabled person who must remain at home can be a productive employee in an information related job. This model also provides an employer with a technique for getting a temporarily disabled person back to work as early as possible.

In the eyes of many, information technology has a serious negative side effect known by the term "automation." It has become a common belief that automation will result in the widespread replacement of people with machines, and therefore, massive unemployment. It is certain that many jobs being done by humans will be performed by machines in the future. This may even result in some instability in the labor force as it shifts to the information sector of the economy. However, high levels of long term unemployment would begin to choke off the economy and dampen the markets of the automating companies. Furthermore, as Levitan and Johnson (1982) points out, large scale automation would require massive levels of capital investment as well as substantial losses in existing facilities and equipment. Consequently, automation is not likely to have an appreciable impact on the aggregate unemployment levels in this country.

A world of caution is in order for the rehabilitation professional concerning automation and employment. Automation tends to be applied initially to jobs involving routine and repetitive tasks. As rehabilitation professionals, we should carefully examine the types of jobs in which rehabilitation clients tend to be placed and the susceptibility of these jobs to automation. We may find that the types of job preparation provided these clients precludes their rapid absorption into the information segment of the labor market. The result could be a severe constriction in the job market for disabled persons.

Impact on the Rehabilitation Professional

Rehabilitation is a complex process usually involving the coordinated activities of numerous organizations and individuals. However, much of the "front line" responsibility for the rehabilitation of disabled persons lies with the rehabilitation counselor. It is usually the counselor that must assess the eligibility of an individual for rehabilitation services, determine the person's rehabilitation goals, develop a plan for achieving those goals, and monitor the implementation of that plan. The role of the counselor determines to a large extent the success of the rehabilitation effort.

Anything that can be done to assist the rehabilitation counselor in the rehabilitation process should have a positive impact on the rehabilitation of a disabled person. The selection of strategies and procedures for assisting the rehabilitation counselor is heavily dependent on the role of the counselor is perceived to have in the rehabilitation process. If the counselor is viewed as a psychological diagnostician the most effective assistance would be in the form of a better diagnostic instrument. Similarly, if the counselor is perceived to be a psychotherapist then updated training in therapeutic techniques would probably be of greater utility.

The case can be made that the rehabilitation counselor is an information or knowledge worker as much of the counselor's tasks involve the collection and organization of information in order to effectively plan and manage his or her caseload. Initially, the counselor must gather information concerning an applicant's disability, work history, etc., to determine the individual's eligibility for services. Then, assuming the person is eligible, the counselor collects additional information and integrates it with the existing information in order to arrive at an appropriate goal and rehabilitation plan. Although the process is oversimplified here it seems clear that information is a critical resource to the rehabilitation counselor.

The management of an individual case can require the effective use of large quantities of information. Eligibility determination, as mentioned earlier, can require an analysis of data on the nature and scope of the person's disability, the person's past work history, previous rehabilitation services, etc. This process can be facilitated through the use of a computer based management system. Thus, the counselor can gather this information and enter it into a client data base. Later, the counselor can ask the computer to pull up the information and organize it in a manner that would facilitate eligibility assessment. The computer could also at the request of the counselor, apply selected analytic tools to the case data. These might include, for example, predictions of case success, estimates of case cost and so on.

The development of a rehabilitation plan requires the integration of a great deal of information about the client and the nature of the job market. In particular the counselor needs to know the client's occupational aspirations, aptitudes for specific jobs, and the availability of the services necessary to achieve a vocational objective and the cost of these services. Current information technology could make such information readily available to a counselor. In the future, for example, a counselor

could examine a data base containing a list of services provided within a specified area. Additionally, the counselor could, for any given vendor, obtain service cost estimates and estimates of vendor effectiveness based on previously served clients. All of this would be available to the counselor on demand.

An area of chronic concern to rehabilitation counselors is the use of similar benefits. In order to make maximum use of available case service funds, counselors are continually told to secure, where possible, payment for necessary services from other organizations. One of the primary difficulties in doing this is keeping track of policies, practices, and eligibility requirements of other funding programs. In the not too distant future, it is feasible that rehabilitation agencies will make this information available to counselor via an online computer system. Ready access to information of this type could substantially facilitate the utilization of similar benefits. This, in turn, would result in the more efficient utilization of agency funding.

Staff and budget reductions have imposed greater demands on rehabilitation personnel. Rehabilitation counselors must often manage larger caseloads using fewer resources. Effective management of a caseload requires an ability to know the complete status of each case. This, of course, presupposes the availability of information regarding those cases. Obtaining such information from manual information systems (i.e., file cabinets) would clearly be a cumbersome task.

The application of a computer based information system will virtually eliminate the data collection and handling burden from the job of caseload management. The counselor will be able to simply ask the computer for a case status report, for example. The computer would then scan each client case file and develop the summary report. The counselor, in turn, could request detailed client data if needed. This same general process could also relieve counselors of much of the routine reporting burden often imposed on them.

One of the primary benefits to the application of information technology to rehabilitation counseling will be the enhanced professionalization of the counselor. The technology, if properly applied, should reduce the administrative and "paperwork" burden on the counselor leaving the counselor more time to work with the client, the client's family, and the employer to maximize the chances of rehabilitation success.

The rehabilitation manager will also be a major beneficiary of new information technology. Managers of rehabilitation agencies must have the

ability to collect, organize, and process vast quantities of information in order to effectively manage their programs. They must be capable of assessing the overall performance of the program as well as attending to individual cases that may be deviant in terms of program resources or case progress.

Information systems of the future will provide managers with these capabilities. Appropriate developments of the current technology will provide managers with immediate access to virtually all relevant program information. Furthermore, in the event of program performance deficiencies, these systems will assist managers in developing corrective courses of action. This, in turn, will result in the enhanced capability of rehabilitation managers to optimize the performance of their programs.

Conclusion

In terms of the general evolution of information technology, most of what has been predicted in this paper will probably be realized. This will not occur spontaneously, however, through the mere passage of time. Rather, market forces are in place along with sufficient incentives and corporate direction to see that they materialize.

The integration of this technology into the lives of disabled persons and the practice of rehabilitation is not assured, however. Rehabilitation does not currently appear to have sufficient influence in the technology market place nor is there sufficient aggregate attention in this areas to cause these things to occur. Yet, this probably does not need to be the case. We can, as rehabilitation professionals, take collective steps to obtain the maximum benefit from the information technology revolution.

We need, for instance, to carefully study the labor market, associated with the information industry. In particular, we need to know the constellation of jobs that make up the information industry now and those that will make up the industry in the future. We also need to know the level and types of skills that are required by these occupations. We could then use this information to restructure our training and job preparation programs to produce qualified candidates for jobs in the information sector. In this way, we could maximize the degree of fit between rehabilitation's job ready client population and the demands of the labor market.

We need to stimulate research and development in the area of human interface devices for persons with disabilities. In particular, we need to learn ways in which we may eliminate the structural barriers to the use of information technology by disabili-

ed persons. This could open a wide range of personal and vocational opportunities for persons with disabilities.

We need to carefully examine the viability of Home Work type employment programs for disabled persons. We need to know, for example, the range of jobs for which it seems to work and those for which it does not. Further, we need to understand effective techniques of communicating work tasks to remote workers and supervising their performance. This knowledge may facilitate the implementation of Home Work type programs and reduce employers' reluctance to install them in their organizations.

We need to thoroughly study ways in which information technology can be brought to the aid of the rehabilitation professional. We need to know the information needs of rehabilitation professionals and the types of information support tools and systems that would maximize their effectiveness in serving disabled persons.

Most importantly, as rehabilitation professionals, we need to organize ourselves to decide what the technological future should look like with respect to disabled persons and the practice of rehabilitation. We could then take the steps to cause that future to unfold.



References

- Boraikoi, A. (1982) The chip. *National Geographic*, 162(4), 421-457.
Davis, G.B. (1977). *Introduction to computers* (3rd Ed.). New York: McGraw Hill.
Feigenbaum, E.A., & McDorduck, P. (1983). *The fifth generation*. Reading, MA: Addison-Wesley Publishing Company.
Leviton, S.A., & Johnson, C.M. (1982). The future at work: does it belong to us or to the robots? *Monthly Labor Review*, 10-14.
Naisbitt, J. (1982) *Megatrends*. New York: Warner Book, Inc.
Schmittroth, J. (Ed.). (1983). *Encyclopedia of Information Systems and services*. (5th Ed.) Detroit: Gabe Research.
Siwolop, S. (1983). Touching all the data bases. *Discover*, 68-71.

Footnotes

- (1) Central Processing Unit -- the component of a computer system containing its logic and control circuitry.
- (2) Bit -- a single digit in a binary number system. Thus, it can only take a value of 0 to 1. Computers internally represent bits as magnetic states or high versus low voltage levels. Any number can be represented in binary by assembling the appropriate sequence of bits just as any number can be represented in decimals by generating the appropriate string of decimal digits.
- (3) The terms of microcomputer, minicomputer and mainframe have been used in the past to denote general classes of computer equipment. They indicated, at least implicitly, the capabilities of computers. Advances in the technology have significantly blurred distinctions among these categories.
- (4) Computer memory refers to the components of the computer used to store information on a short-term basis and for immediate processing.
- (5) A disk is a flat, circular piece of rigid metal or flexible plastic (diskette) coated with magnetic recording material similar to that found on audio cassette tapes. Computers use disks to store and retrieve information at high speeds.
- (6) byte -- a sequence of eight adjacent bits. When used to store alphanumeric data one byte can store one character. When used for storing unsigned numeric data a byte can be used to represent numbers ranging from 0 to 256.

Excerpts of Reviews and Comments

The following are excerpts of reviews, comments and questions raised by the Switzer Scholars. These are presented to further stimulate thinking, discussion and action as it relates to the content of CHAPTER 5 by Don McLaughlin).

Don McLaughlin's paper gives new meaning to the quotation that "the only thing constant in life is change."

McLaughlin's perspective underscores the enormous challenge to the rehabilitation professional and the RRCEP program in the information age. Rehabilitation professionals must continue to learn about the change in information technology in order to adequately counsel persons seeking their services. In addition, they must learn to use information technology to perform their own job tasks. All this while continuing to perform their functions as a rehabilitation service provider.

This need was reflected in a poll in rehabilitation professionals surveyed at the July, 1983, American Association of Workers for the Blind national convention. Eighty-five percent of those polled rated

their knowledge of computer access aids inadequate for their current job. Only thirty-six percent had any kind of training with either computers or access devices. (UPDATE, Sensory Aids Foundation, November, 1983).

--Jay Rochlin

I enjoyed reading this paper, but feel a need to caution against putting absolute faith in the computer to take on certain functions. **Artificial intelligence is perhaps the highest level of technology** on which the industry is focusing its attention and may at some point be used in the delivery of human services. The use of artificial intelligence should be limited in the delivery of human services, however.

Though the capabilities of the computer are such that we may wonder whether we will need a human

labor force, we still must be careful not to put too much faith in this revolutionary marvel. This is particularly so when it comes to making decisions that may later change the course of another human being's life. Using computer technology for information storage, transfer, and manipulation tasks may revolutionize the human service delivery system, but will in no way eliminate the need for the **professionally trained rehabilitation counselor**.

The computer or electronic brain can be used to carry out a multitude of functions that the human brain or the biological computer cannot begin to match. Functions requiring the storage and retrieval of millions of bits of information, memory, calculations and manipulation of data is best handled by the electronic brain, the computer.

The electronic brain performs only logical, sequential operations and does so more efficiently and faster than the biological computer ever could.

The biological computer, on the other hand, operates rationally, analytically, intuitively, simultaneously, and holistically, hence, the need for the **rehabilitation counselor** will continue to be a vital part of the process.

-- Ted M. Daniels

This paper is devoted to the application of information processing and computer technology to the problems confronting disabled people and their Vocational Rehabilitation Counselors. Two-thirds of the paper is devoted to an explanation of the design, operation and future developments of the computer. The remainder of the paper is related to the potential applications of computer technology in the field of rehabilitation with special emphasis on vocational rehabilitation. The following points are, in the opinion of the reviewer, important reinforcements of this paper. They are, as follows:

1. The author states that information systems will allow disabled people to perform tasks such as shopping, banking, and correspondence from their homes. While this is, indeed, a convenience for persons with disabilities, it may have a tendency to isolate them more from mainstream society. One of the attitudinal barriers associated with disability is the fact that disabled persons seldom "mix" with their able-bodied counterparts. We should be extremely careful that the computer and the associated convenience that it brings to bear **does not serve to make the disabled person more of a recluse** than he/she presently is.

2. The appearance of effective household robots is several years away. The reviewer has had recent experience with the utilization of the Heron 1 robot

as an assistive device for persons with disabilities in an independent living environment. At the present time, these devices are not sophisticated enough to do the most routine of household chores. It would appear that the cost of robots to perform household duties may be in excess of the handicapped persons' ability to pay. Additionally, the question of who would fund such devices when there are social welfare programs available which provide household chore services is an issue that will have to be addressed before these devices are implemented on a larger scale.

3. Many brain damaged people do not have information processing capability due to the nature of their disability. A person, therefore, with a memory deficiency may not be able to utilize a computer effectively due to the lack of ability of processing numerical/alphabetic information. Post trauma/stroke victims who have expressive and/or receptive aphasia may have to be dealt with quite differently than the individual with a physical disability but having normal/near normal intelligence. The assumption that all disabled people will be able to effectively utilize a computer to process information **is not necessarily a valid one**.

4. The concept of homebound employment is a very meaningful one, particularly for those individuals who need aide and attendant care such as feeding, toileting, etc. However, it was pointed out in other reviews that HUD lease agreements preclude an individual from working at home. While seemingly a minor problem, it does underscore the fact that, at least in HUD subsidized housing, changes will have to be made in lease agreements in order for the "cottage industry" concept to be successful. Again, the relative isolation of the disabled person within the home is a matter that needs to be considered. It may well be that a combination of "cottage industry" and on-site work will be the best alternative for the disabled person. The majority of the time the individual would be at home performing tasks related to information processing but would be periodically required to be on-site for interaction with his/her able-bodied peers.

5. The reviewer concurs with the idea that rehabilitation professionals must carefully examine the types of jobs in which rehabilitation clients tend to be placed and the susceptibility of these jobs to automation. It is imperative that **vocational rehabilitation professionals work with special education teachers** in order that the special education school system can prepare disabled children or meaningful jobs in the 21st century. In other words, the issue of job obsolescence not only has to be ex-

amined from the standpoint of the current disabled job applicant but also from the standpoint of **pre-vocational evaluation**, education, and training programs for the disabled child. It does us not good to spend literally billions of dollars to educate disabled children for non-existent employment.

6. The utilization of computers to facilitate the management of client information of the rehabilitation professional is a significant contribution. However, the data should be structured in an analytical framework to allow the counselor to develop predictors of success on the job for the disabled person. Just to collect data for accountability and documentation purposes is to neglect the real value of computers and information processing, that is the analytical ability of such systems in conjunction with the data bases to predict success on the job. It should also be realized that the data base management system does not eliminate the leg work required for successful client placement. Personal follow up at the worksite is absolutely mandatory if the severely disabled person is to be productive in a mainstream environment. Computers will facilitate this process, but not eliminate it.

7. Throughout the development of data-base management systems for disabled persons, the element of confidentiality must be preserved. The inclusion of significant amounts of information in a system which might have unrestricted accessibility is one aspect that should be given serious consideration. Lawsuits with associated litigation might result if the confidentiality of client records was not preserved.

8. A major question relative to an extension data-base system for rehabilitation counselors and rehabilitation managers, is who will pay for such systems? In Vocational Rehabilitation departments, access to computers in the state data processing system may be limited or nonexistent. A stand-alone computer system exclusively for the use of rehabilitation counselors is a luxury which many states cannot afford. It may well be that the federal government will have to develop a national system supported by federal funds which can be assessed by state vocational rehabilitation professionals. The national system, in conjunction with a local system containing client caseloads, may be the ultimate answer to the problem of funding valuable computer resources.

9. Finally, the rehabilitation professional and their associated management must develop innovative, imaginative solutions to problems confronting disabled people which will utilize information processing technology. To maintain the status

quo is to frustrate the very significant advantages available within an automated information processing system.

-- John H. Leslie

Don McLaughlin's paper is an excellent comprehensive treatise on hard and software technology as it pertains to a broad range of human service disciplines.

The technical development and evaluation of computer hardware technology are most informative and useful because they provide the reader with a deep appreciation and a respect for their major scientific and technological breakthroughs that have been part of today's advanced systems.

The attention given to software developments and innovation particularly as they apply to disabled persons, should be invaluable aids to the professional rehabilitation worker in the field.

McLaughlin captures the sense of "discovery" and excitement in his voyage through each step in the evolution of an expanded new knowledge base.

The many significant developments in technology, as McLaughlin points out, will not only impact on the rehabilitation professional, but equally, and perhaps even more, on all aspects of society.

Our new information base is broader and deeper and consequently our response to disabled individuals must reflect the full impact of the technology revolution.

Rehabilitation professionals must quickly learn and acquire the new skills necessary to provide the services that will enable those with disabilities to function more effectively in society in general as well as in the job market.

McLaughlin brings all these points to a life-like reality and challenges the rehabilitation professional to meet them head on with a sense of responsibility, dignity, intellectual and emotional awareness and a recognition of the opportunity they provide for disabled persons to enhance the quality of their lives.

--Angela Traiforos

It has been stated that the future directions of computer technology will be determined by the marketplace. Traditionally, the "marketplace" has referred to the number of individuals willing to allocate personal financial resources for particular goods and services, thus, the relative size of the demand by a number of people. History, however, provides numerous examples of the creation of significant "markets" or "marketplaces" through the establishment of national goals and/or public will. Wars, the arms race, and the space race all created large markets for specific goods and ser-

vices although they were not to be consumed by individuals. History also indicates that these goal-oriented endeavors have been good for the national economy irrespective of the good accruing directly to the citizenry. The economic impact of these large and momentous national commitments certainly has not been, nor will be, lost on the makers of national policy and shapers of public opinion.

The lessons from history should be clear to disabled people and to the larger rehabilitation community when considering the potential benefits of future computer technology. Economic and political leaders must be convinced to make technology for disabled people a priority in national policy. With such a policy, and with the concomitant public will, a suitable marketplace can be created to drive the necessary technology development and distribution programs. Not only will this marketplace influence the course of future technology, and positively enhance the quality of life for disabled people, but based upon past experience, we can predict that **the national economy will benefit from the national goal-oriented effort.** Further, as in the past, positive technical and medical advances should emerge providing additional value for all of society.

--Lawrence A. Scadden

The accelerating technological developments hold promise of increasingly "user friendly" and compatible information systems that is currently the case. The situation looks encouraging for those of us who are confused and bewildered by the mass of new products, none of which seem to be compatible. I find myself currently in need of interfacing with at least four different computer systems.

Rehabilitation personnel need access to information specialists for training and ongoing assistance. Organizations will need to include technical personnel on staff or gain needed resources by contract. Rehabilitation training programs will need to establish close collaborative relationships with professional technical educators in both pre-service and inservice training of rehabilitation personnel.

We can make an impact by agreeing upon goals and objectives, and taking the necessary steps to meet them. In this sense, the rehabilitation community can assure a proper place for its interests in this continually unfolding new technology world. The need to address the **future now** is urgent!

--Donald C. Linkowski

It is possible that the theme of this conference is most clearly expressed in Dr. McLaughlin's paper. The microcomputer has replaced the philosopher's

stone in the business of transmutation. The stone was sought for its purported ability to change base metals into gold. The microcomputer is praised for its ability to give "cash value" to what might otherwise be base ideas! The computer is touted as the means for discovering information, reworking and analyzing it, transmitting it from researchers to practitioners to patients, and sending other information (such as case histories, treatment records, etc.) back to practitioners and agencies to, ultimately, perhaps, researchers again. It is becoming another indispensable link that binds us all together, like our telephones, our autos, and our professional and social memberships.

Can there be a dark side to this happy picture? Is it possible that the information network so painstakingly constructed might be used for the wrong purposes? Should we be examining security measures even as we set up our transmission arrangements? Are there already at hand some horror stories demonstrating what can happen when information falls into the wrong hands?

--Carl E. Sherrick

Mr. McLaughlin has provided a good overview of computer development and examples of how the computer can successfully be used to serve disabled persons, e.g., through speech synthesis and voice recognition devices. He then shows the impact computer technology has on clients and rehabilitation professionals. For clients it will mean an increased **ability to perform routines of daily life tasks** that they may currently find difficult to do so or unable to do. However, as McLaughlin states, the largest impact will be in the world-of-work. Since society has been in the process of changing from an industrial to an information society, clients and rehabilitation professionals alike must be prepared for the new realities. Previous forms of service provision will change, the types of work will change, salaries will change, and training of clients will undergo significant changes. How can rehabilitation professionals work with disabled persons unless they are aware of and prepared for these changes? Counselors, in particular, must know the types of jobs related to computer technology that may be available to clients both those with high educational qualifications and those with **minimum educational qualifications**. Not every disabled persons will want to be trained as a programmer, nor is every disabled person capable of successfully completing such training. However, there may be jobs related to the computer that disabled persons are capable of doing that do not require extensive education and training, e.g., operating peripheral equipment,

monitoring computers, clerical work in the computer center, etc. It is the responsibility of rehabilitation professionals to find out what is available.

However, as exciting as the new technology is, McLaughlin gives us some caveats to consider. I agree with his statement that the integration of the technology into the lives of disabled persons and the practice of rehabilitation is not assured. Rehabilitation does not currently appear to have sufficient influence in the technology market place, nor is there sufficient aggregate attention in this area to cause things to occur on a large scale. He states

that we can, as rehabilitation professionals, take collective steps to obtain the maximum benefit from the information technology revolution. I say that we must take collective action now. I hope I'm wrong, but I have a gut feeling that rehabilitation is lagging behind and that we really are missing the boat. There are pockets of intense interest, but as a whole, I do not think we are keeping pace. Fortunately, there is still time to **demand our place in the new technology**. But, it appears to me that it will take much more effort, coordination and cooperation among those in rehabilitation than has been shown to date.

--Robert J. Gilmore

Summary of Recommendations

The following is a summary of the recommendations and implications for action developed by the Switzer Scholars as they relate to the topic of the fifth chapter. (The recorder was David Vandergoot).

1. Recommendations/Implications that would enhanced service delivery:

A. We must identify the current information needs of counselors such as the need for local labor market information and develop processes to regularly deliver up-dated information.

B. We need to identify existing information sources and translate these into useful sources for rehabilitation professionals, such as data bases for legal, medical, and software information.

C. Identify gaps in information and develop new information resources that are relevant to the rehabilitation process.

D. Develop an evaluation process using computerized procedures to monitor and evaluate service delivery based on appropriate change in quality of life rather than compliance to laws and regulations. This data base could be used for overall program management by administrators and by case managers for making service delivery decisions.

E. Explore and develop new approaches for meeting the service needs of clients such as computer-assisted instruction for teaching remedial education, social skills, job-seeking skills, technical job skills, etc.

F. We need to apply the new technology, such as interactive and non-interactive video text capabilities, to enhance our ability to **serve rural clients**.

2. Training Issues

A. Provide in-service training in technological developments to rehabilitation professionals to equip them to make informed decisions about applications for the practice of rehabilitation as well as for how they might streamline their workload.

B. Pre-service education needs to integrate computer technology in the instructional design as well as the content of the entire curriculum, thus developing a flexible learning approach to content while equipping students with information-age literacy skills at the same time. Rehabilitation (RSA) should fund university rehabilitation counseling education programs to develop these kinds of integrated curricula. RSA should also invest in current educators, through financial inducements in order to provide them with appropriate technological literacy learning experiences.

3. Research Issues

A. Identify appropriate procedures for developing localized labor market information.

B. A Rehabilitation Engineering Center should concentrate on developing **human access technology** specifically for the disabled populations such as devising alternatives to keyboards for information entry.

C. The National Institute on Handicapped Research (NIHR) needs to encourage a comprehensive approach to further the design of

conceptual models of the rehabilitation process and encourage the application of a common set of objectives and guides to serve as basic building blocks of a rehabilitation data base. The application of this information system across rehabilitation programs, public and private, will provide excellent research opportunities for understanding with relevant factors in achieving successful rehabilitation, including the impact of technological applications on persons with disabilities.

4. Other Recommendations

A. A centralized mechanism is needed that will serve as a technological information resource and review system for the field of rehabilitation. This could be in the form of networks linking those who are involved in various aspects of technological applications. The information in these networks should be accessible to consumers, service professionals, researchers and other relevant rehabilitation groups.

Existing commercial information networks could serve as a vehicle for this mechanism such as a Bibliographic Retrieval System. NIHR should explore the possibility of working with the private-for-profit sector to develop an implementation plan for this approach.

B. RSA and NIHR should consider sponsoring an ongoing forum to help educate the rehabilitation community, particularly those involved with research, about state-of-the-art technology so that those in the rehabilitation field can anticipate future technological developments rather than react to them after they reach the market. The research arm of the rehabilitation community must take the lead in integrating this technology for rehabilitation purposes. A core group of technological experts should be identified to serve as ongoing technological consultants to the rehabilitation leadership at the regional as well as the national level.

Special Papers: Technology and Rehabilitation



1. High Tech/High Touch - Making Good on the Promise

By Douglas A. Fenderson



2. Rehabilitation in the Information Age

By Alan M. Hofmeister



3. Rehabilitation Counseling in the Age of Technology

By Valerie Ellien



4. The Potential of Technology for Rehabilitation

By David Vandergoot

High Tech/High Touch Making Good on the Promise

Douglas A. Fenderson, Ph.D.
Director, National Institute of Handicapped Research
U.S. Department of Education

Some 31.5 million Americans -- 14.6% of the non-institutionalized population -- have a limitation of function caused by a chronic health condition (DeJong, 1983). Of this number, DeJong notes some 7.9 million are classified as severely disabled and both the number and incidence of disability is increasing. For example, the incidence of severe disability has increased more than 70% from 1966 to 1979, from 213 per 10,000 population to 365. This rise is in some important sense a credit to improved primary and secondary preventive measures in a humane and caring society. Over the years improved perinatal care, trauma, and rehabilitative care, surgical and antibiotic treatment, and geriatric care have contributed to this improvement.

As you might expect, the likelihood of disability increases with age and decreases with level of education (Wolfe, 1982). Disabled persons are less likely to be married or white and much more likely to live in the east, and south central part of the United States.

How will this "High Tech/Information" revolution affect the one of seven of our citizens who have a disability?

A related trend involves institutional care. Although I do not have current data, fewer retarded or mentally ill persons are being placed in large public institutions and many there are being released to other less restrictive environments. In fact, a major priority of Mrs. Madeleine Will, the new Assistant Secretary for the Office of Special Education and Rehabilitative Services (OSERS), is to increase this trend both through financial incentives and improved access to necessary community services.

The subject of this conference is Computers and the Disabled. The implications are many, diverse, and of varying consequences. On the one hand, this

technology, in relation to a confluence of social streams is pervasive and profound in its opportunities and impact. On the other hand, it will, in some instances, present new obstacles to the inclusion of disabled persons in the mainstream of American society. Let's take a closer look at these trends.

In his recent best-selling book, *Megatrends*, John Naisbitt (1982) tries to characterize the current global social and economic revolution as a movement from industrial society to information society. His data are persuasive. Although the traditional service sector has remained quite stable since 1950 at about 11 to 12 percent, the "information occupations" have exploded from about 17 to 60 percent. In addition, the manufacturing firms which have increased their work force during the 1970s by only about 5 percent, also employ a large and increasing number of information workers. To emphasize this rapid shift from a goods versus service/knowledge economy, he points out that the largest single employment category by 1979 was clerical, followed by professional, -- with information jobs comprising some 16 percent of the overall work force.

About 90 percent of job growth since 1970 has been in the non-goods area, and much of it in small businesses and state and local government. Naisbitt cites a 1967 U.S. Department of Commerce study of the size of the "information worker" work force, which makes a distinction between the primary and secondary information sectors. Adding them, the study shows that 46 percent of the gross national product (GNP) and 53 percent of earned income was accounted for in the information sector. The study's author, Dr. Marc Porat, says simply that

the information economy has grown "by leaps and bounds" since then.

Literacy -- to say nothing of computer literacy -- is now a major political issue, and both are of importance to the full inclusion of the disabled in our society. Secretary Bell (1983) estimates that 23 million Americans are functionally illiterate.* And if, by one estimate by Naisbitt, some 75 percent of the jobs in our economy by 1985 will involve computers in some way, many who do not know how to use them may well be disadvantaged. Although these trends may be of limited importance to the increasing population of older and/or poorly educated disabled persons, surely the crisis in education in the United States will have a profound effect on our younger disabled citizens. Those of us who direct our energies into means for including disabled citizens in all aspects of social and civic life have a special concern for their education, and where possible, computer literacy. Or, it may well be, that lacking such opportunities and possibly special speed-enhancing adaptive interfaces, disabled students may again fall behind.

USA Today, Tuesday, August 30, 1983, featured a front page story, "Computer gap grows in school." Citing a recent National Science Foundation (NSF) study, it reports that computer instruction in schools is strongly skewed towards boys in suburban and affluent urban areas. Although racial differences are not large, 13 year-olds in the west were twice as likely as those in the southeast to have had computer experience in school. Overall, however, only about one-third of 17 year-olds in the large national sample had used a computer in school. The implication is diminished job opportunities for the poor, female, and rural students.

Contrast this with recent congressional testimony by Dr. K.R. Jhin, Assistant Superintendent for Instructional Technology, Washington, D.C. Public Schools. He notes a general improvement in standardized test scores over the past three years, in part in response to the incorporation of computer assisted learning into the school program. Dr. Jhin reports that all D.C. teachers and administrators are being "retrofitted" for computer literacy to make use of the 1,450 computers now on hand. All new teachers must demonstrate computer literacy as a requirement of completion for the ninth grade.

Secretary Bell, quoting President Reagan, says, "We're stepping into a new economic era and one

of the most challenging and exciting decades in our history. High technology is revolutionizing our industries, renewing our economy, and promising new hope and opportunity in the years ahead." (Feb. 14, 1983). The Secretary notes, "A consensus find American education at the very heart, or at the roof of a society in transition from an old industrial base to a new info-high-tech-service age. And the condition of American education is found to be wanting, to be mediocre and needing a transformation, a revitalization all across the board from pre-school to continuing life-long learning." He cites six prestigious blue-ribbon commissions recently arriving at a similar conclusion, that our future as a country is at risk because of the serious deterioration of school achievement in the United States, particularly in such vital areas as mathematics and the sciences. These general educational and computer literacy concerns are the basic importance.

The National Institute of Handicapped Research (NIHR) has a special interest in this particular area. Although our \$30 million program is small by comparison with most federal agencies, we are the largest single source of support for rehabilitation research. In addition, we are required by law to convene at least quarterly the legally mandated Interagency Committee on Handicapped Research, which includes the 33 federal agencies with identifiable research portfolios relating to disabled persons. We are now assembling the entire catalog of disability research supported by the federal government in a simple computerized system, Interagency Rehabilitation Research Information System (IR-RIS), soon to be accessible through the Bibliographic Retrieval Service (BRS).

It goes without saying that virtually all the 27 Research and Training Centers, 18 Rehabilitation Engineering Centers and 16 Research and Demonstration projects (funded by NIHR) use, develop and apply computer technology in one way or another. Let me illustrate the nature and extent of our investment in computers and the disabled with the following brief summary. It might suffice simply to say that we support the work of (your next speaker) from the University of Wisconsin, Greg Vanderheiden. Even a casual review of the published literature on this subject provides a clear indication of his extensive and practical contributions. Although this work cannot be captured in a title, it is one of four (NIHR funded) centers or projects emphasizing computer interface and communication augmentation for severely disabled persons. Research includes tracing of eye movement and gaze via corneal reflection and micro television cameras, use of Morse Code and vibrotactile

* On September 7, 1983, President Reagan announced a national program to combat illiteracy. Computer technology will play a significant role in this effort.

stimulators for deaf-blind; devices to aid in speed of input, (my colleague, Dr. James Reswick, uses the term "computer-speak" to refer to special commands used to elicit a communication sequence); and other non-vocal communication procedures and devices. Contributing to this area are, in addition to the University of Wisconsin, are Tufts University, Smith Kettlewell and the United Cerebral Palsy Foundation of Kansas.

A second major segment of our computer-related portfolio is in the quantification of the performance of disabled persons. We support five projects in this area -- at Harvard/MIT, Tufts New England Medical Center, Rancho Los Amigos Hospital, The University of Minnesota, and the Dallas Rehabilitation Foundation. Although each project is unique, they include multiple simultaneous data input on gain, pressure, position, range, energy cost and other factors in 3-D, and real time. Results may be too complex for analysis by inspection and pattern analysis is required to tease out the clinically useful findings. These studies promise greater precision in diagnosis and assessment as well as criteria against which to measure improvement in function.

A third major NIH commitment is in micro technology applications to Functional Electrical Stimulation and we support three centers in this work. The grandfather of them all, supported over the past decade through our international program, the Rehabilitation Institute of Ljubljana, Yugoslavia, along with Rancho Los Amigos and Case Western Reserve University. The most applied product coming out of this work is the Scolatron, developed at Rancho Los Amigos. It involves selective electrical stimulation of muscles during sleep, to stop or reverse spinal curvature. Other work includes experiments with standing and limited walking in persons with paralyzed limbs, therapeutic stimulation of denervated muscles and control of incontinence, one of the primary reasons for institutionalization of the elderly.

A fourth area of computer application support relates to studies of brain dysfunction. Four Research and Training Centers are studying various aspects of the use of computers both for diagnosis and treatment of perceptual, cognitive and language dysfunction. Centers applying computer technology to these problems include New York University, Emory University, Northwestern University and the University of Washington.

Other significant work includes: chip technology in the development of a new generation of hearing aids improving intelligibility of speech by deaf persons (Gallaudet College in Washington, D.C.), wheelchair controls and related scanning and pro-

tective devices for severely disabled persons (University of Virginia Medical Center, and Northwestern University Prosthetics and Orthotics Center), Robotic prostheses for amputees and upper limb paralysis (MIT, Northwestern University); and the development and maintenance of disability-related data bases on:

Job Opportunities and Experience of Deaf Persons - University of Arkansas

Rehabilitation Research and Devices for the Disabled (NARIC, ABLEDATA) - Catholic University of America.

Inventory of Reasonable Accommodation in the Work Place - President's Committee on Employment of the Handicapped.

National Spinal Cord Injury Rehabilitation Data System - University of Alabama, Baylor University.

Vocational Rehabilitation Data for the United States, University of West Virginia.

As part of a Presidential initiative to stimulate small business, NIH is reviewing some 39 proposals relating to disability. Two-thirds of them are for applications of computer technology. We also receive unsolicited proposals a few of which are intriguing. One identifies several problems of profoundly retarded persons and suggests a series of robotic type solutions ranging from memory prompting for personal hygiene through the creation of artificial environments which provide education and function-enhancing entertainment.

Another proposal describes progress in the energy of detailed anatomic data into computer storage and suggest that surgeons may be able to "try out" various procedures by simulation, having visual access to the site of intervention from any angle. A rehabilitation related application, for example, would be repositioning of the head of the femur (in preference to a metal prosthetic insert) by removing a wedge of bone to change the angle of the articulation. Computer "surgery" would permit detailed scrutiny of the location and angle of the wedge cut and the resultant change in repositioning of the asatabulum.

Currently, NIH has no authority for supporting unsolicited proposals. However, regulations have been drafted to correct this deficiency and will be published in the **Federal Register** for public comment around January 1, 1984. Also, by that date we expect to announce the availability of small (up to \$50,000) and medium (up to \$150,000) field-initiated grants. We will also announce the second "class" of rehabilitation research fellowships which will provide a one-year stipend to individual investigators of from \$25,000 to \$30,000 plus a small

expense allowance. Through these means, we expect to consider a whole new range of application of computer-related solutions to the personal, domestic, medical, social, and vocational goals of disabled persons.

Under our authority for international programs, a guest from Australia visited some 30 -- primarily NIH supported -- Rehabilitation Engineering and Research and Training Centers throughout the United States. His trip was a backdrop for plans in Australia to develop a rehabilitation engineering program. His report to us was disturbing. He said we went about it backwards. Our work, he contended, was driven by the often esoteric needs and interests of engineers and their students. It lacks the real life experience of large numbers of disabled persons. He also contends that highly vaunted concepts of interdisciplinary teams are seldom to be seen in practice. Typically, the physicians are too busy with the business of medicine to engage in genuinely collaborative work with technicians and engineers. He also says our technology programs tend to function in relative isolation from each other.

In a similar vein, Henry Blaszyk (1980), Principal of the Widener Memorial School, says, "We serve over 400 physically handicapped children with a wide range of physical abilities; an age range of 4½ to 21 years, an I.Q. range of 22 to 140, and yet no other research agencies, computer companies, book publishers, or game-makers have attempted to utilize the tremendous resource of our pupils or staff in product development.

In another critique of our technology program, the author says that the number of resulting products now in use by disabled persons is pitifully small, some six products he estimates, in ten years of Rehabilitation Engineering Center (REC) support.

Our Australian friend said that their approach will be to establish centers where the technology-related needs of disabled persons may be assessed using, to the greatest extent possible, adaptations of existing technology. The identification of problems which require evaluative study, standard-setting and the engineering of new products, would be driven by the needs of disabled persons and therefore would be more functional and efficient than our top-down approach. I take these criticisms of our work in technology very seriously and will be considering several approaches to the increasing collaboration of our Research and Training Centers and Rehabilitation Engineering Centers, and possibly, through professional societies and community facilities, to more realistically and pro-

ductively engage the needs and goals of disabled persons themselves.

Another major problem we see in the adaptation of computer technology to the life goals of disabled persons is cost. Several rehabilitation engineers have told me that this is the single most distressing aspect of rehabilitation engineering today. Not only are rehabilitation engineers able to design and fabricate adaptive devices, but most are able to perform consultations for vocational counselors (Project IMPART from Texas, for example) that can make a significant contribution to the rehabilitation outcome. Through education, counselors are becoming more aware of the potential for technological consultation, but the problem of payment for unique or adaptive devices remains.

In seeking an answer to the cost question. I discovered from Dr. Justus Lehmann, University of Washington, Seattle, that they have solved the problem in their setting. They have on staff a person skilled at securing needed resources for a given client. This staff person tries every conceivable source, -- public and private -- insurance, voluntary health organizations, service clubs, community organizations, churches. Dr. Lehmann reports that no truly needed device has been denied for lack of a sponsor. If you think this sounds too good to be true, some of you with this problem may want to write to Dr. Lehmann for advice.

I introduced my paper with reference to **Megatrends** and will conclude with it, as well. Naisbitt forecasts that during the 1980s, the international electronics business will top \$400 billion, the largest business ever created on this planet. Can anyone, including skeptics and critics, deny this reality?

The twin cities (Minneapolis/St. Paul) is one of the major high tech centers in the United States, surely, in part, a credit to far sighted corporate leadership, a strong base of public and private education and the cultural and recreational richness this environment affords.

In the early years of Control Data Corporation, I read a speech by its president, William Norris, which set out a "strategic vision" of the future of computer technology. He used an analogy to Edison's light bulb. The Scottish scientist, Lord Kelvin, found Edison's work ridiculous -- what foolishness to envision a system of **shared light** -- to have light wherever, whenever, and at whatever intensity desired! The vision was not only a bulb, but a generating and distributing system. Norris' analogy is obvious. A particularly current example of the progress toward the strategic vision is a two-page advertisement in the September, 1983,

"Smithsonian" by GTE. The ad shows a physician checking the indications and cautions for the use of erythromycin on his terminal. The ad then states that the first nationwide computerized medical information system, a collaborative project of GTE and AMA (American Medical Association), is now in service. It can provide immediate access to participating physicians on the "latest knowledge and information on drugs and diseases." Local terminals are connected to the GTE telenet and central computer. The ad concludes that the system is expected to save physicians an enormous amount of time, and "quite possible, something a lot more valuable."

The title of this paper is from Naisbitt, who says flatly, "The technology of the new information age is not absolute. It will succeed or fail according to the principles of high tech/high touch." He explains that as our work tasks move inexorably in the direction of the manipulation of abstract symbol, data mediated process for the production of desired goods and services, the human need for personal relationships, values, beliefs may be increased. Unless the high tech environment of the future finds a strong counterpart in, for example, the human potential movement, the great and potentially liberating achievements of technology will be blighted.

One of the great pioneers of the computer age was MIT mathematician Norbert Wiener. You recall, he coined the term cybernetics in 1943 and co-authored the book, **The Human Use of Human Beings**. Toward the end of his career, he became increasingly concerned with this humanizing theme. He wrote a little science fiction piece, a modern version of the Faust plot of selling one's soul to the Devil. The ultimate evil, in this story, was for humans to lose control of their creations.

Although based on more than 20 years of research support through RSA (Rehabilitation Services Administration), NIHR as a distinct research institute is only five years old. The chief architect of NIHR was Dr. William Spencer, Director, TIRR (Texas Institute of Rehabilitation Research). I told him last spring of my concern for an organizing theme, a strategic vision, for the long range plan of NIHR. He gave me a little monograph (April, 1980) resulting from an international conference. He said the emerging concept was fundamentally different from the traditional rehabilitation program. It was, "Include the Disabled." That doesn't sound very profound, does it? In the old rehabilitation mode, we begin with an **impairment**, which limits function (disability), which in relationship to personal goals and environment, constitute a **han-**

dicap. The emphasis is, of necessity, on difference, defect, gap. The new concept, Spencer says, goes further. Not all impairments repaired, not all functions restored, not all personal goals achieved. The new concept is simply to **include disabled persons**. The old paternalism is gone. We share the basic promise and plight of all humanity -- and we seek to achieve a barrier-free society for all citizens -- a universal **value** of including all our citizens in all aspects of society. **COMPUTERS AND DISABLED PERSONS INCLUDE DISABLED PERSONS!**



References

1. DeJong, Gerben and Lifchez. (1983). Physical Disability and Public Policy, *Scientific American*, 248, No. 6., 41-49.
2. Ibid.
3. Wolfe, Barbara L. (1982). How the Disabled Fare in the Labor Market, *Research Summaries*, 48-52.
4. Naisbitt, John. (1982). *Megatrends*, Warner Books, New York.
5. Bell, T.H., Secretary, U.S. Department of Education, (1983). in a speech delivered at the White House Conference on Productivity held at the Busch Center, St. Louis University, June 22.
6. Blaszczyk, Henry J. (1981). Computing and the Handicapped: The Challenge in Education. *Computer*, 15-17.
7. Spencer, William A., M.D. (1980). *The Inclusion of the Handicapped Person in Community Life*. Monograph on International Conference held in Houston, Tx., April 10-15.

Rehabilitation in the Information Age

By Alan M. Hofmeister

Introduction

We, the present adult population, represent the last generation of the industrial age. The present school-age population is the first generation of the information age. We are participating in a massive change in the very structure of society. For those of us whose life span will include the transition between these two ages -- the industrial and the information age -- this is indeed a time of wonder, challenge, and confusion. Like the adolescent caught between childhood and adulthood, we are experiencing that strange mixture of excitement and confusion as some of our traditional reference points dissolve and we try to determine which of the new directions has substance and which are shallow, seductive facades.

1. Information Age or Computer Age

Contrary to the suggestions of the press and notwithstanding *Time* magazine's award to the computer as the "machine of the year," the major phenomena we are witnessing is not a computer revolution. The major phenomena is the birth of the information age. By assigning the information age the role of umbrella phenomena, I in no way want to belittle or minimize the impact of the computer. The computer is the major tool of the information age and must receive recognition along with other information age technologies, such as laser and genetic engineering technologies.

The field of rehabilitation has much to lose by taking a computer or hardware orientation rather than an information orientation. To assume that development in electronic personal assistive devices exemplify the major contributions of the information age is to grossly underestimate the range of disciplinary involvement and the range of handicapping conditions that can benefit from the information age. This point can be made by references to developments in artificial intelligence.

2. Artificial Intelligence

It has been called the "fifth generation" or "second computer age," and it is characterized not so much by increases in the power of the hardware, but by dramatic increases in the sophistication of software. In the approach to the software, we find a change of emphasis from stressing information peculiar to the computer to an emphasis on the crystallization and restructuring of knowledge in the area of interest, be it medicine, sociology, counseling, or any other field where expert knowledge has value.

In discussing the fifth generation, Feigenbaum and McCorduck (1983) observed,

We view it as the important computer revolution, the transition from information processing to knowledge processing, from computers that calculate and store data to computers that reason and inform. Artificial intelligence is emerging from the laboratory and is beginning to take its place in human affairs. (p. 1)

The early years of artificial intelligence (AI) research were characterized by a belief that it was possible to identify a few basic laws of reasoning; couple those laws with the speed and memory of powerful computers, and produce practical "intelligent" applications. In reality, these general-purpose, problem-solving approaches proved to be too weak when applied to specific problems. In reaction, a number of researchers deemphasized computer information processing. For them, the structure and nature of knowledge itself became the area of interest. The terms "knowledge engineering" and "knowledge programming" reflect their thinking. Expert systems are a "knowledge engineering" development.

Sefik et al. (1983) describe expert systems as follows:

Expert systems are problem-solving programs that solve difficult problems requiring expertise.

They are termed knowledge based because their performance depends critically on utilizing facts and heuristics used by experts. Expert systems have been used as vehicles for AI research with the rationale that they provide a forcing function for research issues in problem solving and a reality test for their workability. (p. 59-60)

The purpose of an expert system is, then, quite simply to capture and replicated the problem-solving procedures of an expert. Areas of expertise that have been successfully captured include medicine, geology, and computer science. Expert systems are restricted to narrow areas within each of the fields. Examples of expert systems include:

DENDRAL. A system that infers molecular structure from mass spectrographic information. One research study has shown the system to out perform expert chemists on certain problems.

MYCIN. One of the most famous of expert systems gives consultative advice on diagnosis and therapy for infectious diseases. Studies have shown the system to compare favorably with the advice of recognized specialist in infectious diseases.

CADUCEUS. Another expert system in medicine performs diagnoses in internal medicine.

PROSPECTOR. This system gives expert advice on finding more deposits from geological data.

Expert systems are generally designed to perform one or more of the following tasks: diagnosis, interpretation, prediction, instruction, monitoring, planning, and design.

2a. Expert Systems and Rehabilitation

A review of the above listed generic categories indicates the potential that exists to match "knowledge engineering" approaches with problem areas in rehabilitation. The categories of diagnosis, planning, and instruction are highly related to important rehabilitation activities. If it is possible to use expert systems to capture and replicate the problem-solving processes of expert diagnosticians and therapists in rehabilitation, then artificial intelligence can make a major contribution.

In addition to increasing the availability of high quality, direct services, AI research could improve our thinking about our respective disciplines. In education this point was made by Sleeman and Brown (1982) when describing the development of intelligent tutoring systems. They stated that

Much of what constitutes domain-specific problem solving has never been articulated. It resides in the heads of tutors, getting there through experience, abstracted but not necessarily accessible in an articulatable form. Since a computer-based coach has limited opportunities to learn experientially, at least in the foreseeable future, its

designers must make this knowledge explicit. Likewise in an areas of tutorial strategies, much remains to be discovered and made explicit. We hope that educational theorists will find the explicit formulation of tutoring, explanation and diagnostic processes inherent in intelligent tutoring systems a test bed for developing more precise theories of teaching and learning. (p. 9)

When we take a knowledge enhancement approach rather than a hardware approach to the information age, the concerns of many of the rehabilitation professionals begin to dissolve. For those with concerns that our emphasis on computers will cause a concurrent reduction in our emphasis on people as individuals, a knowledge orientation is a welcome alternate emphasis. If the knowledge orientation base in a discipline is concerned about the individual, then enhancement of that knowledge base must work to the benefit of the individual. This point has been summarized by Hayes-Roth et al. (1983) as follows,

... knowledge engineering will catalyze a global effort to collect, codify, exchange, and exploit applicable forms of human knowledge. In this way, knowledge engineering will accelerate the development, clarification, and expansion of human knowledge itself. (p. xii)

3. Information Transmission and Rehabilitation

As was previously implied by the above-listed statement by Hayes-Roth et al., the information age is concerned with both the enhancement and exchange of information. In rehabilitation we have a constant need for effective information transmission. If we do not have an information transmission process in which the needs of clients are being communicated and the knowledge of service providers is transmitted in response, we do not have a rehabilitation program. The significant improvements that occurred in the quality of life of sensory persons with disabilities, as technological aids facilitated communication for hearing and visually impaired, may have served to distract us from the value of, and need for, increased communication for all persons with disabilities.

Examples of communication technologies that have relevance to rehabilitation include:

3a. Computer-Assisted Instruction (CAI)

This technology allows instruction to be delivered in a highly replicable manner in a variety of environments. Its value has been shown in vocational training and in situations where individuals with transport restrictions have been able to bring instruction to them rather than having to attend instructional settings that were difficult to access.

3b. Computer-Managed Instruction (CMI)

This technology is concerned with the application of the computer to monitoring of program activities and determining where program objectives are not being met. CMI is essentially a vehicle for program improvement; it provides information on problem areas and information on the effect on efforts to improve program quality. The effectiveness of CMI is closely tied to the degree to which the computer can record change in important client behaviors.

3c. Videotex

Videotex is the term used to describe any system which makes computer stored information available via computer screens or a printing terminal. Videotex exists in two forms: interactive and noninteractive.

Interactive videotex. In interactive videotex, information usually moves via telephone lines. The user may interact through a personal computer, a terminal with a screen and keyboard, an adapted television set, or a printing terminal. Most interactive videotex systems are designed to allow the individual to conduct in-depth searches through large amounts of information. The individual can work in either a search mode or an interactive mode in which the individual adds information to the system as well as retrieves information.

With interactive videotex technology it would be possible for an instructional service provider to access a demonstration of a specific instructional sequence on a videodisc stored at a remote site, receive suggestions for teaching a specific self-care skill, or treat a problem behavior. The search provider could then leave a message for a resource professional requesting help on a problem not covered by the packaged instructional program. The professional could then reply in person, by phone or by electronic mail.

Electronic mail is the term for the electronic distribution of messages. While most forms of telecommunications are "real-time" communications, electronic mail is not. Messages are sent and stored until the recipient wishes to read them. This facility has some of the advantages of normal postage, which allows the individual to choose when to read or respond, but with the speed of electronic communications.

Electronic mail systems usually include electronic bulletin boards, where messages of general and specific interest can be "posted." A number of states have developed state-wide videotex systems which include bulletin boards for persons with disabilities and professionals serving the disabled.

Noninteractive videotex. Noninteractive videotex is usually transmitted in association with television signals. A television signal that is received in the home is capable of carrying more information than we are presently using. If a modification is made to the television set, additional information can be accessed. One example of this capacity for extra information transmission is the captioning service available for the deaf -- a noninteractive videotex service. Noninteractive videotex information bases are usually limited to several hundred pages of information, and while individuals with modified televisions can select from among the available pages of information, they cannot enter information into the system. These noninteractive videotex services often duplicate some of the offerings of the daily newspaper and carry information that can be updated daily.

The pages of information offered by these noninteractive videotex services are available for purchase in a manner similar to that in which advertising space is sold on television. This means it is possible for rehabilitation programs to obtain command of a number of the available videotex information pages to keep their clients informed on events of interest.

Conclusion

When one examines the components of a rehabilitation program, with its large numbers of diverse treatment objectives, its multitude of environments, its need for continuity of treatment across environments, its range of professional and paraprofessional service personnel, and the range of disciplines involved, there can be little doubt that the enhancement of knowledge and the effective transmission of knowledge are clearly critical to the development and maintenance of program quality. For this reason the rehabilitation professional has a responsibility to become literate in the opportunities offered by the knowledge enhancement and knowledge transmission technologies of the information age.



References

- Feigenbaum, E.A., & McCorduck, P. (1983). *The Fifth Generation*. Reading, MA: Addison-Wesley.
- Hayes-Roth, F., Waterman, D.A., & Lenat, D.B. (1983). An overview of expert systems. In F. Hayes-Roth, D.A. Waterman, & D.B. Lenat (Eds.) *Building Expert Systems*. Reading, MA: Addison-Wesley.
- Sleeman, D., & Brown, J.S. (1982). *Intelligent Tutoring Systems*. London: Academic Press.
- Stefik, M., Aikins, Jr., Balzer, R., Benoit, J., Birnbaum, L., Hayes-Roth, F., & Sacerdoti, E. (1983). The architecture of expert systems. In F. Hayes-Roth, D.A. Waterman, & D.B. Lenat (Eds.), *Building Expert Systems*. Reading, MA: Addison-Wesley.

Rehabilitation Counseling in the Age of Technology

By Valerie Ellien, Ph.D.

The impact of technology on rehabilitation is receiving long-due attention. In the last several years, popular literature has increasingly brought attention to the fact that we are in the midst of a social revolution. The transformation from an industrialized society to an information society is directly attributable to developments in high technology: such as computers, satellites, and telecommunications. It is timely that we anticipate the impact of these developments on the ways in which rehabilitation services are provided to disabled people. More importantly, we will need to prepare rehabilitation professionals very quickly to accommodate the changes we can already envision, and those which are already here.

The purpose of this paper is to review and recast the role of the rehabilitation counselor in light of the impact of technology. Some implications for training rehabilitation professionals are also suggested.

Rehabilitation Counseling: Past and Present

The role of the rehabilitation counselor has been researched, defined, and re-defined for many years. Early role and function studies (Muthard and Salomone, 1969) became the basis of the Rehabilitation Counselor Education curriculum still utilized in most universities. The clinical or psychotherapeutic model is the core of counselor training. As a result, rehabilitation professionals tend to perceive themselves as functioning primarily in a dyadic relationship, i.e., the counselor/client interaction defines the realm in which the counselor operates.

More recent studies (Fraser and Clowers, 1978) have called attention to the fact that counselors spend a minority of their time counseling with their clients. Coordination of services, administrative and

case management activities, and record-keeping are still predominant activities. Discussions about "counselor burnout," or "role strain" (Emener and Rubin, 1980) suggest the negative effects on rehabilitation professionals who can not function as they were initially trained to, and want to perform.

Computerized case files, data bases with information on community resources, and occupational matching systems all promise to radically change the way counselors now work. It has been suggested that this computer technology could lighten the burden of "paperwork" and "administrative detail" now carried by counselors, thus freeing them for more client contact, and counseling activity. The suggestion may act as a motivator, encouraging counselors to learn these new methods. However, it may also be misleading and based on a faulty premise and an outdated model of what it is that counselors actually do.

The Counselor As Information Specialist

As we become more conscious of the meaning and impact of the information age, it is also clearer that rehabilitation professionals are information specialists. They function as experts and resources to disabled persons, their families, employers, and to the community-at-large. Rehabilitation counselors must have access to, and transmit, detailed information about implications of disability, jobs, educational and training opportunities, community resources, and social programs affecting the disabled person. In addition, the counselor operates within a program or agency requiring knowledge of policy and procedures, such as eligibility requirements, methods of documentation, case planning, and budget constraints. Each program, further, is part of a complex network of community,

state, and federal programs which can have some bearing on the needs of a disabled person. The counselor-advocate must have information about such programs to assist clients to access and negotiate what are often complex and, at times, "unfriendly" systems. Finally, counselors function as intermediaries for disabled people and employers in the labor market. They facilitate the labor market transaction (job placement) by providing relevant information to both clients and employers (Granovetter, 1979).

Future Directions

The technology of the information age promises to greatly enhance all of these counselor functions. Computerized systems will significantly improve the quantity and quality of information available, and the speed with which it is accessed. For example, computer programs can facilitate collection and interpretation of diagnostic information and match it to occupational and labor market information. Current research suggests that in the future, counselors could have access to computerized prediction models of client success in the labor market (Worrall & Vandergoot, 1982), decision-making models for determining eligibility, and estimating case costs, and other detailed case management data.

Clearly the role of the counselor has been and will continue to be revolutionized by the impact in information technology. Increasingly, rehabilitation professionals will need to utilize technology to manage information about all the systems in which they and their clients operate.

This suggests the need for a different perspective and approach to defining how counselors function. The clinical orientation, or psychotherapeutic model alone is not sufficient in this new age. We must adapt for the sake of the client that we are trained to serve.

A systems approach toward understanding and solving the problems of disability has become increasingly relevant (Stubbins, 1982; Vandergoot,

1982). Counselors as information specialists must be aware of the social, political and economic systems affecting disabled people. Knowledge of disability policy, income maintenance and transfer programs, labor market theory, and work organizations has become even more important than ever. In practice, rehabilitation professionals must be adept at developing and maintaining critical networks. Recent research indicates that a networking approach toward working with the business community has a large pay-off to rehabilitation programs and ultimately to clients, resulting in job openings, labor market information, and technical assistance from employers (McCarthy, 1982). It is probable that communication theory and research on networking will continue to have much utility for affective relationships with disabled persons as counseling theory and psychotherapeutic interventions.

The age of technology has clearly expanded the realm in which the rehabilitation professional must operate in order to efficiently assist disabled persons. The challenge posed to counselor educators and their training programs is a major one and one whose time for new approaches is upon us.



References

- Emener, W., & Rubin, S. (1980). Rehabilitation counselor roles and functions and sources of role strain. *Journal of Applied Rehabilitation Counseling*, 11(2), 57-69.
- Frazer, R.T., & Clowers, M.R. (1978). Rehabilitation counselor functions: Perceptions of time spent and complexity. *Journal of Applied Rehabilitation Counseling*, 9(2), 31-35.
- Granovetter, M. (1979). Placement as brokerage-information problems in the labor market for rehabilitation workers, in Vandergoot, D., and Worrall, J.D. (Eds.) *Placement in rehabilitation: A career development perspective*. Baltimore, MD: University Park Press.
- McCarthy, H. (1982). Partnership as a method of enhancing attitudes and behaviors toward employment of disabled individuals. *Rehabilitation Counseling Bulletin*, 26(2), 119-138.
- Muthard, J.E., & Salomone, P.R. (1969). The roles and functions of the rehabilitation counselor. *Rehabilitation Counseling Bulletin*, 13, 1-168.
- Naisbitt, J. (1982). *Megatrends*. New York: Warner Books, Inc.
- Stubbins, J. (1982). *The clinical attitude in rehabilitation: A cross cultural view*. New York: World Rehabilitation Fund.
- Vandergoot, D. (1982). A systems approach to rehabilitation program management. *Rehabilitation Counseling Bulletin*, 26(2), 111-118.
- Worrall, J.D. & Vandergoot, D. (1982). A follow-up report. *Rehabilitation Counseling Bulletin*, 26, 88-93.

The Potential of Technology for Rehabilitation

By David Vandergoot, Ph.D.

This Switzer Memorial Seminar has convinced me that the field of rehabilitation ought to actively explore current technological developments for rehabilitation applications. We cannot expect technology experts to apply their knowledge to our concerns simply because our rather small market potential offers little hope for profit-making. Even though there might be a few hardy souls who can see a specific rehabilitation market that can yield a return on a spinoff of a current product, this process will not serve the diversity of our professional needs nor those of our clients.

Similarly, we can not really expect that we can produce enough rehabilitation experts who are technological wizards as well. We have a few of them, some of whom have made valuable contributions to this seminar. However, we cannot expect them to shoulder our entire responsibility for being up-to-date regarding technological applications.

Rehabilitation is an applied discipline. We have successfully and creatively borrowed from psychology, sociology, economics and from other more basic disciplines. We need to have the same openness to those sciences which are evolving current technological developments.

Bruyere's Switzer paper has documented why the field of rehabilitation needs to be involved with technology. Her advice is strengthened by her experience with a variety of these applications. She has been there and she survived. The rest of us can expect to survive as well. Her hands-on experience lends credibility to her observations and recommendations.

The "why" of our involvement stems from the core of our philosophy. We have chosen this profession because we saw a need to serve people with disabilities. Many of us have complained about paper work and bureaucratic jungles that smother the free flow of information so necessary to how we serve people. These recent technological innovations were designed to overcome problems just like the ones we have complained about. If these are real barriers and not just excuses we will get excited about putting these new resources to work. We have an obligation to be involved.

Bruyere points out that the new technology has the potential of saving costs from our training, travel and communication budgets. These savings can be transferred to client services. Again, this is not a choice. It is our obligation. If we find the technology does not deliver, then we have a choice. We do not use technology for the sake of using technology. We must use it to serve the needs of people with disabilities.

We cannot expect to encourage our clients to pursue employment in technology-related fields if we ourselves do not demonstrate an appreciation for its value to ourselves and how we do our jobs. After all, we will become models for our clients whether we like to be or not. If we tell them about exciting new technological careers, we need to model that excitement in how we go about our own work.

In spite of this apparent need for commitment to learning as much as we can about using technology, the discussions generated by the Switzer Scholars indicated that we in rehabilitation have

such an inadequate background from which to assess newer technological developments. The ability of Scholars not directly associated with rehabilitation to communicate their concerns and wisdom regarding the new technology was encouraging. If rehabilitation professionals are to adequately evaluate and apply technology we are obligated to maintain contact with these Scholars and others like them who can fill the voids in our knowledge. Otherwise, we will make mistakes out of ignorance or do nothing out of fear.

In order to keep abreast of technological developments, we need new structures and opportunities which will generate dialog between rehabilitationists and technology experts. Rehabilitation engineering centers have done well in developing specialized applications. However, if rehabilitation services are to reflect the potential for clients this technology offers, we need more than special institutions. We need to find ways of equipping our educational and service programs with the menus for evaluating how best to take advantage of new development. Rehabilitation educators need to find ways of delivering content which incorporates knowledge of technology while at the same time exposing students to hands-on experiences with computers and other innovations. In-service and continuing education programs need to design train-

ing programs that will give practicing professionals these experiences as well. Program administrators need to incorporate technology-related equipment and professional expertise into operational budgets. Our professional associations must provide leadership, as NRA has done in sponsoring this Seminar, and challenge members to become personally committed to learning about the potential of technology. Our federal and state rehabilitation agencies need to develop priorities with real backing so that new mechanisms can be created to enable professionals to deal intelligently with technology. Many of the recommendations generated by the Switzer Scholars provide examples of concrete actions that can be taken now to achieve these possibilities.

We need to approach technology applications broadly and energetically. Healthy skepticism is useful as well. Technology, as with other products of human minds, can be used for good or ill. As rehabilitation professionals, we must use our knowledge of our clients and our own needs as the touchstone to evaluate what we will apply and what we will send back to the laboratories. The control of these applications must be based on the knowledge we have of the needs of those people we are called to serve.

□

NRA Officers and Board of Directors

1
9
8
3

President
Marvin Spears**
St. Paul, Minn.

President-Elect
Thomas Gaines**
Atlanta, Ga.

Past President
Dan McAlees**
Menomonie, Wisc.

Treasurer
David Horn**
Tupelo, Miss.

Northeast
Barbara Banks
Manchester, N.H.

Mid-Atlantic
Vernon Hawkins
Washington, D.C.

Southeast
Lonnie Ladson, Jr.
Athens, Ga.

Great Lakes
Gary Austin**
DeKalb, Ill.

Southwest
Jack Roper
Del City, Okla.

Great Plains
Dale Sattler
Dickinson, N.D.

Pacific
Randy L. Gray
Mesa, Ariz.

Member-At-Large
Rosemary McClain
Baltimore, Md.

Member-At-Large
Arnold Stanton
Newark, Del.

Member-At-Large
George A. McCrowey
Chicago, Ill.

Member-At-Large
James B. Adams
Paducah, Ky.

Member-At-Large
Willie L. Horne
Greenville, Miss.

Member-At-Large
Edward H. McMillion
Columbia, S.C.

Chapter Presidents
Steven E. Kapalka
Lincoln, R.I.

Consumer Members
Margie Sloan**
Atlanta, Ga.

Division Presidents
Larry Warnock
Boston, Mass.

Non White
Ted Daniels
Washington, D.C.

JPD
Roberta Housman
Bronx, N.Y.

NARI
Vaughn Kesterson
Mt. Ida, Ark.

NARS
Marcella Jesse
Pierre, S.D.

NRAA
Joan T. Barker**
Versailles, Ky.

NRCA
Betty Hedgeman**
New York, N.Y.

VEWAA
Robert Davis
Indianapolis, Ind.

NAIL
Richard R. Nichol
Davenport, Ia.

** Executive Committee Member

Commission on Professional Concerns

Joan T. Barker, Chairperson
Versailles, Kentucky

Betty Hedgeman, Co-Chairperson
New York, New York

Barbara Banks
Manchester, N.H.

Amos Sales
Tucson, Ariz.

Jake Smith
Waycross, Ga.

Charles Penn
Louisville, Ky.

Arnold Stanton
Newark, Del.

Margaret Robinson
Charleston, W.V.

Mike Blankenship
Indianapolis, Ind.

Gary Austin
DeKalb, Ill.

Robert Brabham
Columbia, S.C.

Spencer Mosley
Green Bay, Wisc.

Bill Calzaretta
Hickory Hills, Ill.

Maurice LaPlace
Newark, Del.

Kathy Sampeck
Cockeysville, Md.

Mary E. Switzer Memorial Seminars in Vocational Rehabilitation

Please follow instructions and return this entire sheet to NRA to order your monographs.

Switzer Monographs Special Package Offer

NRA is offering a "Special Sale" of its Mary Switzer Seminar Monographs at the current time. The offer is available through the mail via the national office of NRA.

Monographs #2 through #8 will be sold as a "package" for \$40.00 a set. Following are the titles and single issue prices:

☐ #2 -- *Rehabilitation of the Older Blind Person: A Shared Responsibility.* (\$6)

☐ #3 -- *The Role of Vocational Rehabilitation in the 1980's: Serving Those With Invisible Handicaps.* (\$6)

☐ #4 -- *Rehabilitation of the Mentally Ill in the 1980's.* (\$6)

☐ #5 -- *International Aspects of Rehabilitation: Policy Guidance for the 1980's.* (\$6)

☐ #6 -- *Women and Rehabilitation of Disabled Persons.* (\$10)

☐ #7 -- *Rehabilitation in the Public Mind: Strategies of Marketing.* (\$10)

☐ #8 -- *New Technologies and Rehabilitation In the Information Age.* (\$10)

* Monograph #1 is sold out and cannot be offered either as part of the package or in single copies.

The Monographs are used throughout the nation and abroad for a wide range of disciplines in the social and rehabilitative services. In addition, the monographs are useful tools for administrators, practitioners, policy-makers, legislators, researchers, education specialists and consumers.

★ Each Monograph is based on a special topic or target group. For example, Monograph #4 focuses on the **Rehabilitation of the Chronically Mentally Ill** (see listing on the left.)

To order the entire set of seven monographs check this space ☐ (\$40.00 for the entire set).

To order individual copies, check the box next to the copies or copy you wish listed on the left.

Should you want more than one copy of a Monograph, note the Monograph number and the number of copies below:

MAIL YOUR CHECK WITH YOUR ORDER TO:

Switzer Memorial Fund
National Rehabilitation Association
633 South Washington Street
Alexandria, VA 22314

Please print your address clearly:

Name: _____

Title: _____

Street: _____

City/State/Zip: _____

Switzer Seminar Planning Committee

Following is the list of members who comprised the Planning Committee for the 1983 Mary Switzer Seminar. They worked with Seminar Coordinator Dr. Leonard G. Perlman and Switzer Memorial Committee Chairperson Dr. Gary F. Austin.

Ted Daniels, M.S.*

*Executive Assistant to the Administrator
D.C. Rehabilitation Services Administration
Washington, D.C.*

Thomas Fleming

*Special Assistant
U.S. Office of Consumer Affairs
The White House
Washington, D.C.*

James Galetka

*Research Associate
Electronics Industries Foundation
Washington, D.C.*

Kali Mallik, Ph.D.*

*Executive Director
Baltimore County Rehabilitation Alliance
Baltimore, Md.*

Martha Redden, Ph.D.

*Director of Special Programs
American Association for the Advancement
of Science
Washington, D.C.*

Lawrence A. Scadden, Ph.D.*

*Private Consultant
Arlington, Va.*

Angela Traiforos, M.A.*

*IAM & Aerospace Workers
Disabled Workers' Program
Washington, D.C.*

David Vandergoot, Ph.D.*

*Research Coordinator
Human Resources Center
Albertson, N.Y.*

Joseph Moriarty, Ph.D.

*Director
West Virginia Research and Training Center
Dunbar, W.V.*

** 1983 Switzer Scholars*

1983 Mary E. Switzer Memorial Committee

Gary F. Austin, Ph.D., Chairperson

*Northern Illinois University
DeKalb, Ill.*

Betty Hedgeman, Ph.D.

New York, N.Y.

Marvin Spears

*NRA President
Ex Officio*

Bill Gardner

Charleston, W.V.

David Mills

*NRA Executive Director
Ex Officio*

Joseph Owens, Jr.

Washington, D.C.

Joan T. Barker

*Chairperson
NRA Commission on Professional Concerns
Ex Officio*

Despite the demands on the national and federal scene, her presence was almost ubiquitous in behalf of program development and extended services to needy people. On a regional, state or local level, be it public or voluntary services, if it were in the interest of rehabilitating those in need, somehow, she would "arrange to be there."

The WHO'S WHOs has chronicled her many national and international awards. Also recorded are her presidencies of many organizations including NRA, whose members and their efforts she held in high esteem. But she did not reach the heights of her ability when she was made the first Administrator of the Social Rehabilitation Services, not when she retired from the position, nor when she became internationally involved in the World Rehabilitation Fund. Instead, she found her greatness when she touched each of us bringing our full humanitarian efforts and qualities to the fore in behalf of disabled and disadvantaged people. While readily recognized as a truly great administrator in the classical sense of the word, her true capacity and ability can only be appreciated when we realize that these accomplishments sprang from an inner expression of sensitivity, emotional refinement and dedication to serve all less fortunate people. Her egalitarian qualities were not contrived but spontaneous, stemming from love and respect for all living things.

All of us in NRA and in rehabilitation and all handicapped people have had better, more meaningful, and more productive lives because her presence and her being were sufficiently large to embrace and accept us as we are and help us better understand where we should be.

What more can be said than that we had the joy and privilege of knowing her?

This memorial tribute is quoted from E.B. Whitten,
Journal of Rehabilitation, November/December, 1971

Mary E. Switzer Memorial

**To perpetuate the memory of a great
women and a great leader in the field of
Rehabilitation by establishing a memorial
that will expand and enrich services to
handicapped individuals**
